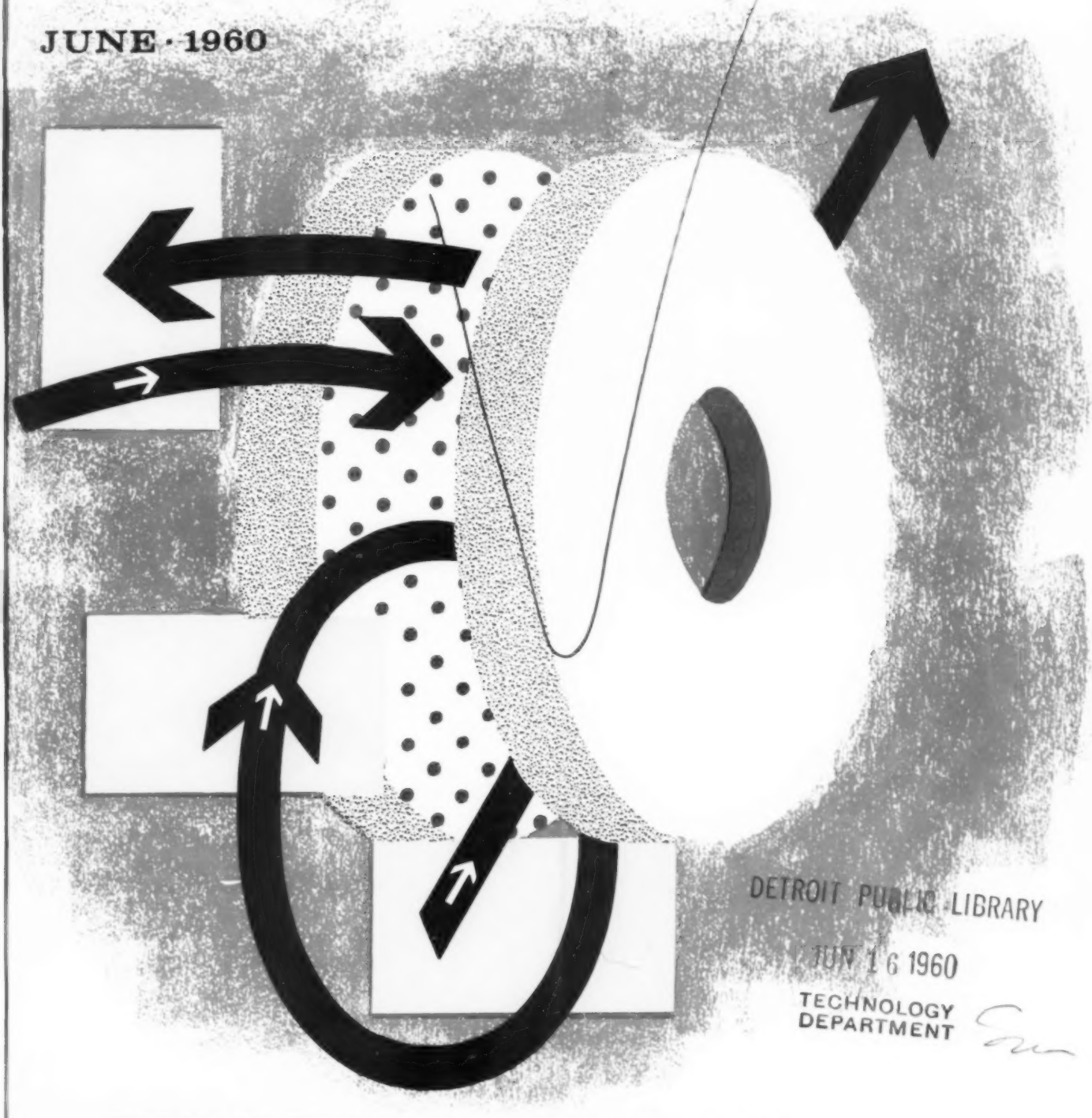
GRINDING and FINISHING

A HITCHCOCK PUBLICATION

JUNE · 1960



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TECHNOLOGY DEPARTMENT

SHOULD YOU USE DISC GRINDING?

IN THIS ISSUE:

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Abrasive Cutting Part II page 40
How Honing Improves Gear Quality page 47

the quality of YOUR PRODUCT'S surface *depends* on the surface of the roll.....

photograph courtesy Landis Tool Co.

HERE'S PROOF OF PERFORMANCE . . .

HOT MILL WORK ROLLS
(Chilled Iron)

Roll size—25½" x 66" long

Comment—"Since this is a new plant and operators are limited in experience, this wheel has increased their production and produced a good finish of 15 to 20 Micro Inch. All operators are pleased with this wheel. It grinds 100 rolls in 95 hours."

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WHEREVER ABRASIVE OPERATIONS ARE PERFORMED

GRINDING and FINISHING

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Special to GRINDING and FINISHING

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June Cover: Some artistic license is taken in the cover depiction of double spindle disc grinding, but the result, with arrows showing the paths of workpieces in each of the three methods of feed, and with the disc perforations showing as they never would in a photo, is an improved explanation of the process.

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Dean Strand solved an unusually dif

Dean Strand's many years as an Abrasive Specialist and a salesman for machinery that uses grinding wheels have covered most of the problems in the book. That's why he so often finds practical solutions that are *not* in the book.

PROBLEM—An unusual grinding proble faced Illinois Tool Works, Chicago, whe they began manufacturing a special ste gear shaper cutter. They required a grindin wheel that would generate an involute curv on the sides of the gear shaper cutter teeth grinding with the side instead of the per phery of the wheel.

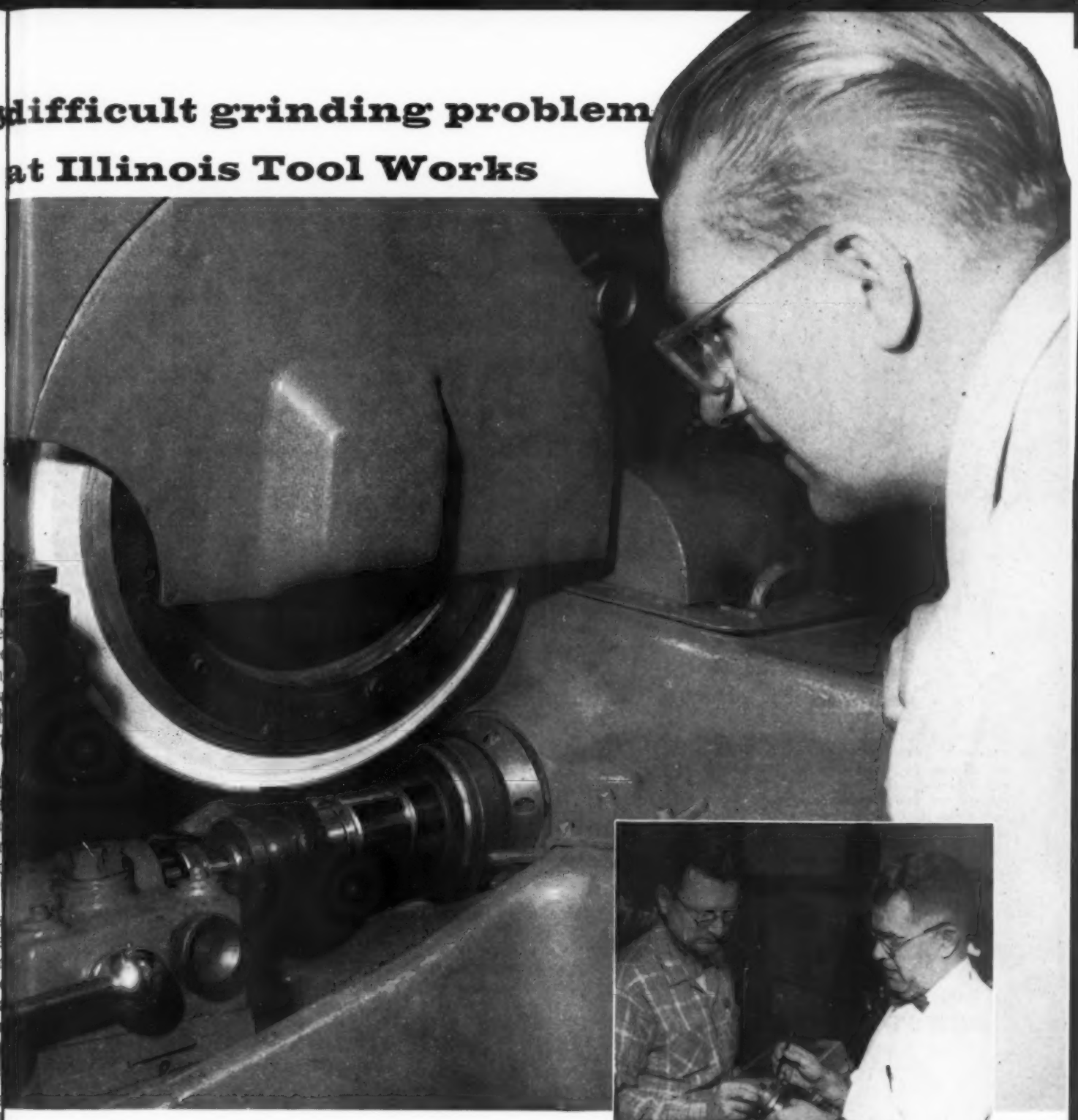
In attempting this grinding operation wit competitive wheels, production was delaye by the wheels breaking down, glazing mutilating the gear-teeth walls. It was in possible to maintain the involute shape the teeth within specified accuracies.

SOLUTION—Bay State Abrasive Specialis Dean Strand was called in and went ove every detail of the operation. He recom mended a 16" diameter x 5/8" thick whe with a highly friable aluminum oxide abra sive and a special Bay State vitrified bon modification, on Illinois Tool's gear-shape cutter grinding machine.

RESULT—No further problems on this gea finishing application! The wheel consistentl maintains accuracies to within 1/10,000-inc and, in the words of Illinois Tool's Proce Engineer Ed Leighton, "we wanted a whe that would grind without glazing, that wou stand up under these unique conditions, tha would give us reasonable wheel life an would enable us to get real *production* o of our machine. Well, thanks to Dean Stran we've got it."

Like Dean Strand, the Bay State Abrasiv Engineer in your area is a trained exper He backs up the work of the experience men who represent Bay State's topflight di tributors; and Bay State's research labs bac them both with new ideas, techniques an materials. *Better grinding at lower cost . . . that is our business.*

difficult grinding problem at Illinois Tool Works



(*Above*) Operator Dale Jackson at his gear-shaper cutter-grinder equipped with a Bay State 16 x 5/8-inch aluminum oxide abrasive wheel. Grinding is done by side of wheel instead of face. 1/10,000" accuracy is consistently maintained.

(*Right*) Process Engineer Ed Leighton and Inspector Leroy Wegner, of Illinois Tool Works, checking the tooth angle on a gear-shaper cutter. Extreme accuracy of the helical lead, and its involute shape, are vital to the completed product.

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Editor's Mail

BOOBY TRAP OF MODERN TECHNOLOGY

In the mail that passes over the desk are often some very interesting and provocative reports. The following is one such report which seems to be outstanding.

Modern technology, despite its wonders, can become a booby trap if it is used "as a mechanical device to relieve the world of the necessity for human judgment," Henry B. du Pont, a vice president, director and member of the Executive Committee of the du Pont Company, said today at the dedication of a new science building at Sul Ross State College.

Technology "abounds with temptations," he said. "Because it is easy to ride, we hesitate to walk. Because we can employ tools, we forget that they were furnished to aid, not to replace, the human hand. Because we can reach far into the sky, we overlook the fact that our roots and our responsibilities are here, deep in the earth.

"Too many of us, I am afraid, rely upon our calculators and our mathematical formulae to chart our course in advance, to prove our case before trial, and to insulate us, in fact, against all risk," he said.

"We seek to apply scientific means and scientific methods to areas in which science is as helpless and out of place as a wild guess in a countinghouse," Mr. du Pont continued. "In launching a new business venture, for example, we all too frequently depend upon a pretested market, only to find that, by the time decisions are made and preparations completed, conditions have changed and our carefully contrived plan is twisted askew."

Mr. du Pont emphasized that if technology is to continue as the source of national strength and popular well-being, "it is of extreme importance that we understand it for precisely what it is—and even more precisely for what it is not.

"Modern technology is a force which brings together machinery and equipment, skills and techniques, men, money, and methods," he declared. "Let us not undervalue its importance; technology is the back-yard gold mine of every American. Our technological progress is, in fact, a national bonanza which has enriched all beyond the dreams of the sourdough prospector, and its potential for further gain is even brighter now than in the past.

But technology has "its limitations as well as its wonders," Mr. du Pont continued. The apparent advantages of automatic machines over human effort "often lead the unwary to forget that machines, too, have weaknesses and, unlike man, do not have the means at hand to correct them," he said. "They are, in fact, subject to one of the most deadly diseases to strike at an economic undertaking. For machines are susceptible at all times to the insidious blight of obsolescence.

"Occasionally, we have seen short-sighted management of some business venture put its whole trust into machines and try to hold back the tide of obsolescence by ignoring or standing aloof from new ideas. Few such firms have lasted beyond the day when they discover that, while men can rise from the ashes of disappointment and disaster, the future of the displaced or outmoded machine lies only in the scrap heap."

The United States "was not built by timid souls whose future could be guaranteed, or those who could measure the degree of risk to which their ventures might be exposed," Mr. du Pont declared.

If education can provide "a clear picture of personal responsibility and of personal initiative, then we can be sure that we will use our science wisely and not permit it to be obscured behind a dust cloud of irrelevant and superficial considerations," he said.

"In this sense, the teachers, and the teachers of teachers, have a very special responsibilty," Mr. du Pont suggested. "It should be the teacher's responsibility to make clear those fundamentals which are the core of a progressive society. For the goal of sound education is not how much we shall know, but how shall we use what we know—it is not the shaping of the intellect that is the prime object, but the shaping of human character."

If young people are "deriving less from their exposure to education than they should, I think it is because they have fallen victim, along with many of their elders, to a philosophy which has for many years held that success by one's efforts is less to be desired than a collective security—a philosophy which, in a word has suggested that the world owes everyone a living . . ." Mr. du Pont said.

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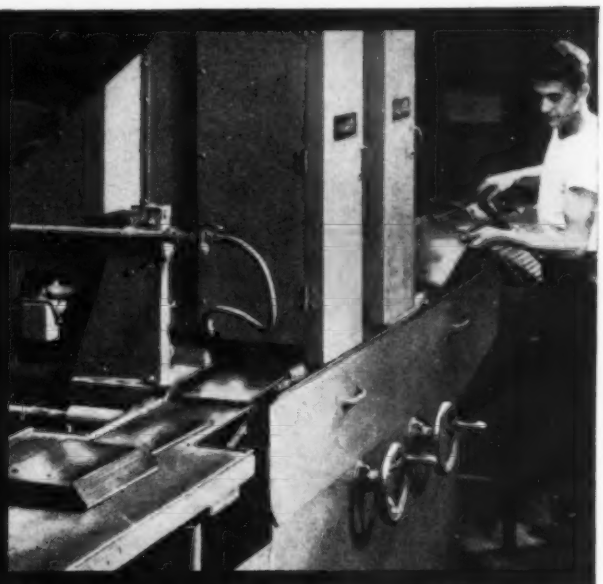
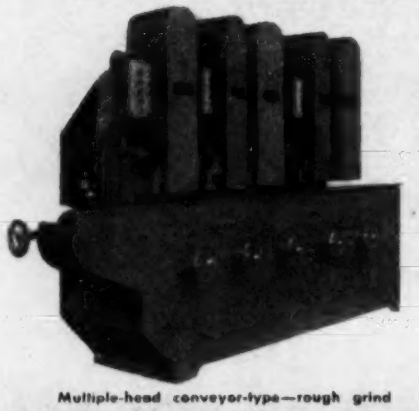
This Sundstrand-Engelberg two-head grinder has a tough job to do. Both sides of a flanged steel base plate require grinding — bottom side needs .002" stock removal, top side must have a uniform 15 microinch finish. The Model 680 belt grinder does the job, day in and day out, at the rate of 500 pieces an hour for the top side, and 475 for the bottom, doubling the speed of former methods. It uses a 120 grit — 320 grit aluminum oxide belt sequence.

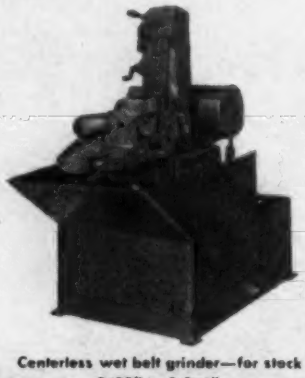
You, too, may be able to drastically improve production and quality on your grinding operations. Send for literature and ask for a Sundstrand "Engineered Production" analysis of your final finishing operations to determine the economic benefits of abrasive belt grinding on your jobs.



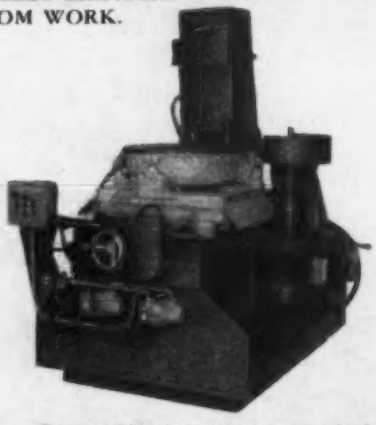
OTHER TYPES OF SUNDSTRAND-ENGELBERG ABRASIVE BELT GRINDERS FOR PRODUCTION, MAINTENANCE, AND TOOLROOM WORK.



Multiple-head conveyor-type—rough grind to final polish in a single pass—any number of heads.



Centerless wet belt grinder—for stock 3/22" to 2-3/4"



Rotary table platen-type—operator loads and unloads without interrupting production.

CHECK THESE FEATURES OF ABRASIVE BELT GRINDING:

Greater production. Because of higher speeds, more grinding area, simpler setups, and no time lost for truing or wheel dressing, production is higher. Belts are sharper due to grain orientation. Flexing works out chips for better cutting edge exposure. Change-over time is reduced to a few minutes. Roughing and polishing can be done with only one setup.

• • •

More versatility. Any material can be machined: metallic or nonmetallic. They're efficient for either mass production, small lots, or toolmaking. They're more easily automated than many other machines.

• • •

Lower cost. Remarkable production lowers costs per piece. You don't need skilled labor for their operation nor elaborate, expensive fixtures. Belt grinders cost less to begin with than most other finishing machines. Also, belts are less expensive than wheels and are much easier to store and handle.

• • •

Simple and safe. Abrasive belt machining is safer because wheel hazards are eliminated. Operator fatigue is reduced and chips present no problems. Belts are easily changed by inexperienced personnel.

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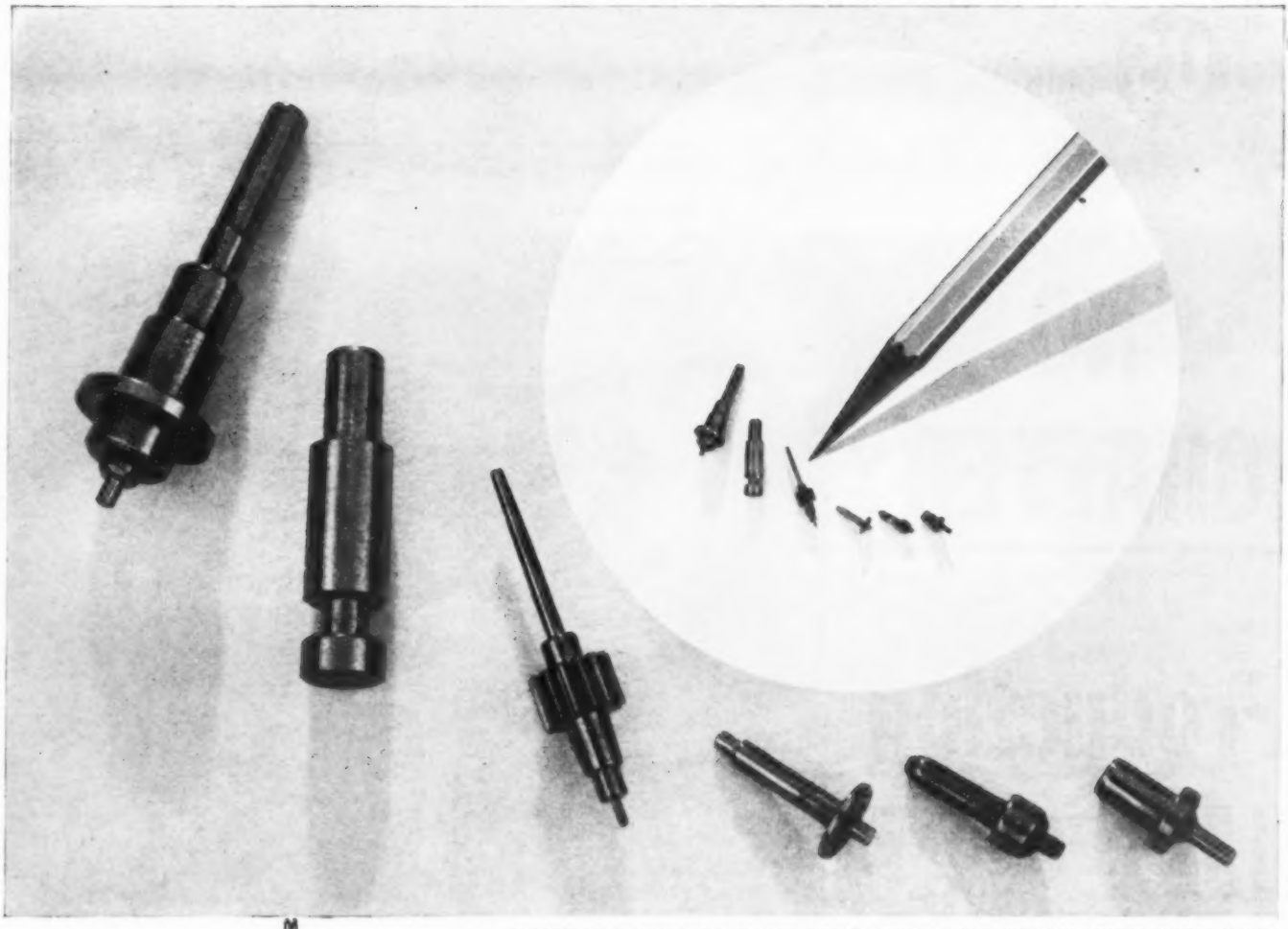

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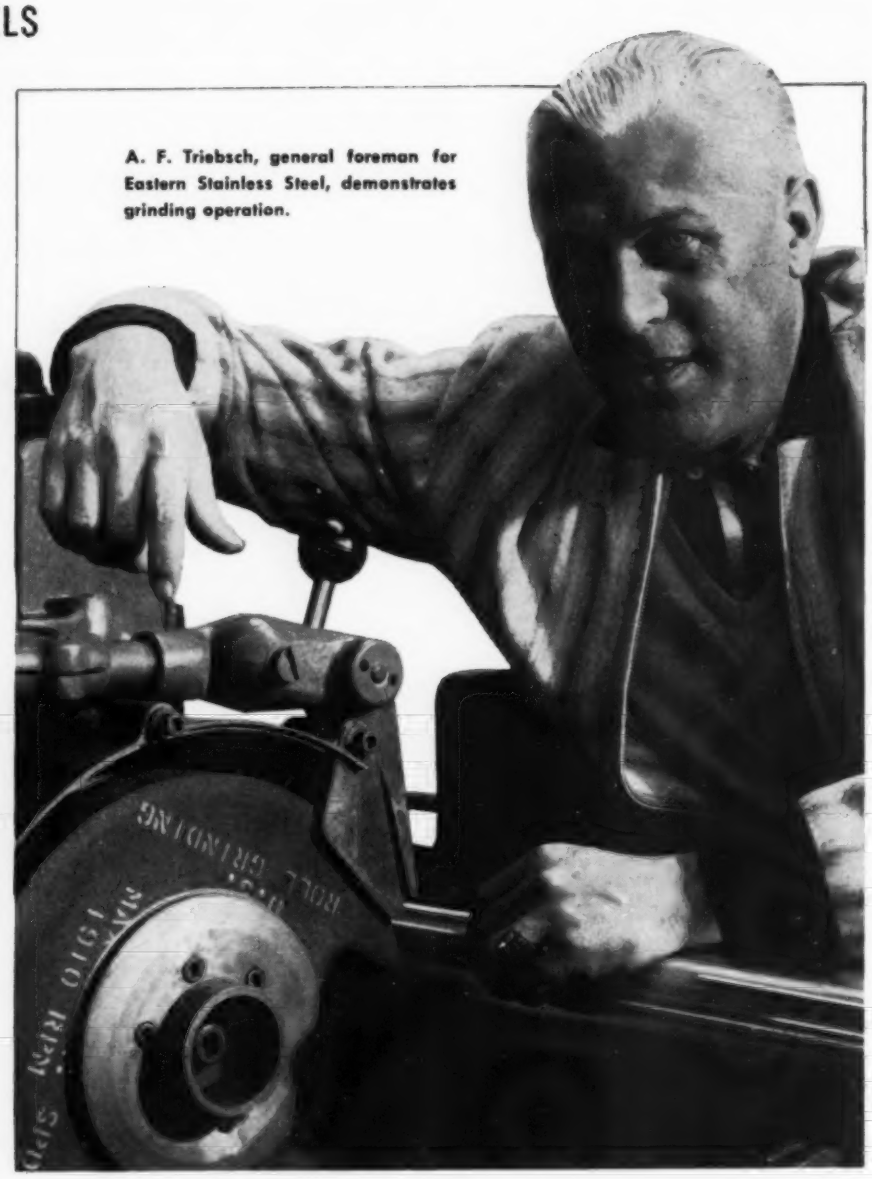

A. F. Triebsch, general foreman for Eastern Stainless Steel, demonstrates grinding operation.

"U.S." Grinding Wheels help EASTERN STAINLESS STEEL achieve tolerances of 2/10 of .001" in precision work

In producing stainless steel of great precision, the steel passes through a succession of work rolls under a combined force of 59,000 pounds per square inch. All the rolls must be perfectly round and the tiniest defect must be eliminated. To produce a perfectly flat mirror finish, the rolls have to be 2/10ths of .001" perfect!

This is the kind of work Eastern Stainless Steel Corporation turns out every day. To keep their rolls in perfect balance and symmetry they use "U. S." Grinding Wheels. These amazing wheels allow for no "chatter" or vibration, consequently they never groove the roll. Prior to the use of "U. S." Grinding Wheels, at least an hour a day was lost when the operator had to readjust the machine.

Using "U. S." Wheels, Eastern Stainless Steel found many collateral advantages. Maintenance was reduced by more than 20%. "U. S." Grinding Wheels outlast conventional wheels at a ratio of 4 to 1, an obvious saving of 400%.

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WHEREVER ABRASIVE OPERATIONS ARE PERFORMED

Editor's Page

JUNE, 1960

ABRASIVE SPECIALIST?

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A few months ago we received a question on a reader service card from W. J. Hepburn, Quality Control Engineer, Lukens Steel Company. Mr. Hepburn's question was, "Should large companies have a grinding technician or engineer?" This question has been in our minds for some time and is, to say the least, extremely thought provoking. The introduction of this question by a reader stirred the coals and has resulted in a number of discussions and comments by our editorial advisory board.

In every case, the question has received a great deal of interest. The answer has always been yes! The editorial advisory board, which is made up of responsible men involved in the use of abrasives by a number of metalworking companies in the Chicago area, had many interesting comments to add to this discussion. One member revealed his past experiences which indicated his unusual interest had resulted in considerable savings to the company but because of his additional duties, many similar savings were not being made. His concern has led him to instigate a move within his company to develop an abrasive specialist.

All of the members of the board agreed that there is a real need for the abrasive specialist in their companies. We have, from our contacts in the industry, set $50,000 as the annual expenditure for abrasives to be the determining point for the need of an abrasive specialist. Here we should relate that another member of the board felt that, although their expenditures for abrasives were quite normal, an abrasive specialist would be extremely beneficial.

To stay within our question, we have established that an average large company spends approximately $80,000 annually on abrasives. They also spend approximately $50,000 on abrasive equipment and $166,000 on labor for abrasive operations.

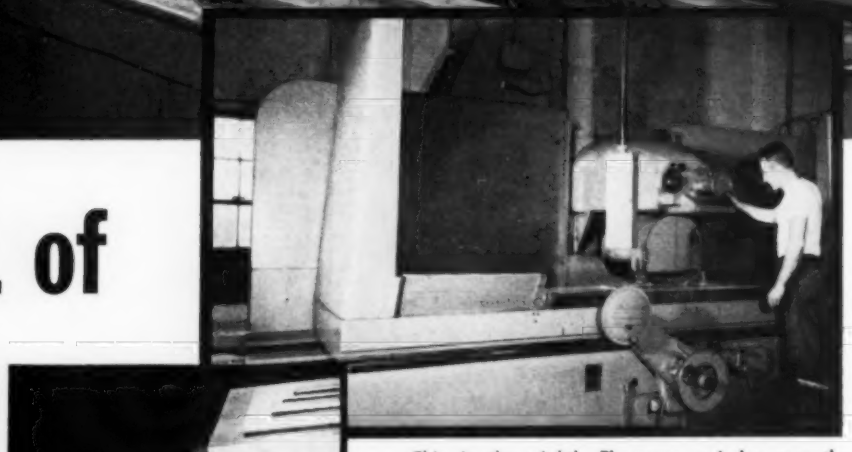
Now, we all realize that you can do most anything with figures such as these and to use the old bromide, "figures don't lie, but liers figure." But, even if we halve these dollars or if you check your own costs, it will lead to some eyebrow raising.

We see little doubt for the need of an abrasive specialist, a man who can establish standards, evaluate buying of specific equipment and materials, concentrate on abrasive methods and point out more economical machining through the use of abrasives. This man will be responsible for judicious handling of $50,000 or more which is now being spent each year by many companies.

W. W. Patterson

Managing Editor

A ROOMFUL of THOMPSON GRINDERS



This is the eighth Thompson grinder recently installed at Jessop which grinds plates and sheets up to 60" × 96" in size.

Jessop precision ground flat stock which is used in gages, dies, verniers and other exacting products.

Pictured above are 4 Thompson Grinders in the Specialties Division of Jessop Steel Company, Washington, Pennsylvania. There are 4 more Thompsons which are not shown in the above photo. All these Thompson machines are grinding to the extremely accurate tolerances and fine RMS finishes that distinguish Jessop's precision ground flat stock.

There are excellent reasons for using 8 Thompsons on this essential production. Mr. Joseph Manfredi, who is responsible for the quality and production of this famous ground flat stock, says, **"We have recently installed our eighth Thompson grinder in this division. We have proven the top performance of these rugged machines for many years. They give us the extreme accuracy and precision we demand—day after day with a minimum of maintenance."**

You may not need 8 Thompson grinders in your operations but it will pay you well to investigate what just one Thompson machine can do toward saving time, improving your products and cutting your costs of manufacture.

Your inquiries are invited.

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You Asked . . .

ARTHUR RAKESTRAW • Contributing Editor

Preventing Loading of Honing Stones

• What is the best way to prevent loading and glazing of honing stones? —H. S., Anoka, Minnesota.

If you have not already read the very comprehensive article on honing by M. M. Patterson in the April issue of GRINDING and FINISHING, we suggest that you look it up. (Editor's note: This is Part III of a four-part series. Reprints should be available in another month or so.)

Most abrasive products during the grinding cycle show a surface loading which is subsequently dissipated by contact and surface speed. In other words, there is constant loading and unloading of the abrasive surface.

If, however, the grinding swarf becomes permanently lodged in the surface pores, we say the honing stone or wheel is "loaded."

Honing stones are often treated with materials of various characteristics designed to fill the pores or voids between the abrasive grains, thereby preventing the accumulation of swarf. Some of the materials, such as sulphur, not only serve the purpose of a filler, but also lubricate the abrasive cutting particles and improve their cutting ability.

In many grinding operations the volume of the abrasive section is not sufficient to accommodate a sufficient amount of lubricant to provide free cutting throughout the life of the abrasive product. In these cases the coolant supply must of necessity furnish a continuing supply of lubricant in addition to flushing the ground surface, removing loose grain and swarf, and maintaining normal temperatures that will permit accurate sizing of the part.

Glazing of a honing stone might result from several causes.

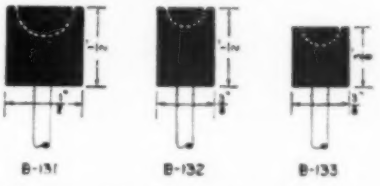
The selection of a softer grade of stone is usually indicated by a glazed stone surface, though machine adjustment can often reduce or eliminate faulty stone selection for the honing of an occasional bore.

Abrasive grains, if bonded too well, will become dull. Normal stone pressure and speed will not dislodge the grain and it soon develops a shine.

On many of the softer materials the selection of the type of stone seems to be of minor importance in the elimination of stone loading. The type of coolant becomes all-important, and the filtration of the coolant compound, equally significant.

Recesses in Mounted Wheels

• What is the reason for the recess or indentation in the end of certain mounted wheels? (Shapes similar to the B-131, B-132, and B-133 shown below.) —W. S., Utica, New York.



The question is not an uncommon one, and the answer is quite simple.

The special shapes of practically all A and B number mounted wheels are strictly for product utility. The shapes you have mentioned, and others which are similar, have a concavity or recess so that the customer may grind on the face of the wheel.

As you probably know, the efficiency of a grinding wheel is dependent to a great extent on its speed of rotation. Going from the periphery of the wheel toward the center, the speed of individual grains decreases until at the center there is a grain which is merely rotating in its own orbit.

If the center section of the wheel were left intact, and the customer intended to grind on the flat face of the wheel, then the center section would not wear away and immediately a high spot would begin to develop. This would interfere with the complete utilization of the wheel body. Hence the indentation.

"How many times have I told you to wipe the abrasive off your feet before you come into the house?"

Future of Man-Made Diamonds

• In your opinion, what is the future of man-made diamonds?—A. D., Greensburg, Pennsylvania.

The introduction of manufactured diamonds a little more than two years ago was an event of tremendous importance to industry. It heralded the end of our dependence on natural stones for the manufacture and sharpening of tungsten carbide tools, which have mushroomed to industry-wide importance.

It also suggested possibilities of extending diamond applications into areas from which they have been kept by short supply. Diamonds are excellent for many applications for which they have not been used, simply because there have not been enough to go around.

The original manufactured diamonds soon gave evidence of superior performance when used in vitrified and resinoid bonded wheels.

Continuing research and development have been rewarded with an entirely

(Turn to page 13)

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also; U.S.A. DISTRIBUTOR FOR SIA SWISS INDUSTRIAL ABRASIVES, LTD.
The first class Swiss quality line of coated abrasives.

You Asked . . .

new man-made diamond grain shape which lends itself to the manufacture of metal bonded wheels, for which the original diamonds were not well-suited. We understand that these are, or very soon will be, available on a commercial scale.

If no further progress were to be made in the development and improvement of diamond crystal shape and characteristics, man-made diamonds have contributed tremendously to our economic stability.

Since the manufactured product is limited in size to approximately 100-mesh maximum, there is a large field of wheel truing, stone cutting, and drilling which will still be dependent on the availability of natural diamonds. We are hopeful that expansion of the present know-how in the new industry will soon find ways and means of extending the size limits to make available production quantities of larger stones.

The manufactured diamond can well take its place alongside of synthetic rubber and other materials which have supplemented or replaced materials whose availability depended largely on world trade conditions. The future of man-made diamonds would appear to be extremely bright.

Wheel Treatment Markings

• What do "untreated," "treated except for (ST)," and "sulphur (ST) treated" mean, as applied to grinding wheels?—C. H., Hatboro, Pennsylvania.

Although we have questioned a goodly number of abrasive wheel manufacturers' representatives, none has been able to identify the exact terminology of your question. The terms and abbreviations are apparently not common to all abrasive wheel manufacturers.

It seems quite likely that this phraseology has been used by some particular manufacturer to differentiate between treated and untreated products which he produces in somewhat equal quantities.

Normally abrasive products would not bear any marking if untreated. They are marked only in differing from the standard.

The abbreviation "ST" might well designate sulphur treatment. Some abrasive wheels and honing stones are so called because they have been impregnated with sulphur in solution, a process which fills the void or voids in the product.

Such a treatment has been found very satisfactory in producing freedom of cut because of its lubricating value.

We would suggest that you contact the manufacturer of the particular product from which you copied the marking, for a complete explanation.

Wheel Guard When Grinding Small Shapes?

• What are the pros and cons of using a wheel guard when form grinding small shapes?—F. V., Brooklyn, N.Y.

There are no pros and cons about using a wheel guard on any grinding operation. Wheel guards are installed on grinding machines for the sole purpose of protecting the operator, and possibly other personnel in the vicinity of the machine, against injury in the event of wheel breakage.

However, it is not uncommon for an operator to remove the wheel guard if it obstructs his vision of the work, or if it interferes with the piece being worked on.

This is a gamble that operators seem willing to take in order to perform the operation without interference. However, we believe that no form-grinding job is worth the loss of an eye or of permanent disfiguration.

If the job cannot be performed with the standard guard, then provision should be made to design sufficient protection against a possible accident, in keeping with the provisions of the safety code.

Resharpen "Throwaways"?

• Does it ever pay to sharpen "throwaway" carbides?—F. M., Staten Island, New York.

In our opinion it definitely pays to sharpen throw-away carbide bits, particularly those that are only dulled. Bits that are badly broken on the cutting edge, or cracked, probably would not justify the expense of resharpening.

It would be recommended that these bits be accumulated until a quantity were available before assigning the job to an operator. It should not be difficult to determine the cost of reconditioning on a small-quantity basis.

Although your labor cost would probably exceed that of the original manufacturer, you are working on carbide at zero cost, and it would seem that your total cost of resharpening would be considerably less than the purchase price of new bits. • • •

"Worst case of gallstones I've ever seen!"

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WATER-PROOF PAPER

Acknowledged all over the world as the finest.

ALSO TRY OUR OTHER PRODUCTS:

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SWISS INDUSTRIAL ABRASIVES, LTD.
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IMPORTANT ANNOUNCEMENT . .

to the readers of GRINDING and FINISHING

Further testing by the Kay and Warren Co. now proves Type RVG Man-Made diamonds used on diamond dies *WILL*, without requiring excessive powder, cut fast enough to be profitable!

Quality - Service

Roux Wire Die Works, Inc.

INDUSTRIAL DIAMONDS AND DIAMOND PRODUCTS
DIAMOND DIES - TOOLS - POWDER

Oriskany, N. Y.

Kay & Warren Company
33 Box Street
Brooklyn 22, N.Y.

Att: Mr. Stanley

We wish to report on the . . . 20-40 micron General Electric "man made" diamond powder as follows:

Both powders - the G.E. and the natural - were used side by side for two specific operations - drilling and shaping diamond drawing dies.

We were careful to select stones for these dies from one source and from one lot from this source so that hardness would be as uniform as possible.

We found both powders to be practically identical in work performed.

. . . each powder was used to remove stock from a given number of dies and the amount of stock removed using the G.E. powder equalled the amount of stock removed using the natural powder.

The G.E. powder seemed to leave a smoother, cleaner surface on the die than the natural powder used, but, on the other hand we have worked with other natural powders which, in our opinion, would leave the surface equal in appearance as the G.E. Strictly a question of grading, more or less.

If the G.E. powder were available at the same price as the natural and if it did not vary in hardness—we believe it would be more profitable to use, as uniform results could be obtained time after time which is not possible with the various qualities of natural powders.

Hoping we have been of some assistance, we are

Yours very truly,

Roux Wire Die Works, Inc.
A. E. Roux

the KAY & WARREN CO. express their gratitude to:
A. E. ROUX of ROUX WIRE DIE WORKS
MAX RIEDL, CHIEF ENGINEER, ACME SCIENTIFIC CO.
MARION COWAN of THE WAYNE WIRE DIE CO.
for their help in researching micronized Man-Made diamonds

the KAY & WARREN COMPANY

DIAMOND POWDERS & COMPOUNDS

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POSITIVE DUPLICATION—EVERY TIME!

These "fingerprints" of a tree will always duplicate characteristics by which an expert can positively identify all cross-sections from the trunk of that tree.

But you don't have to be an expert to get Positive Duplication—when you use these CINCINNATI (PD)* SEGMENTS, and *all* CINCINNATI GRINDING WHEELS.

YOU GET (PD) UNIFORMITY

Cincinnati supplies you with wheels of uniform excellence, because of the unique (PD) manufacturing process which involves 36 separate and unvarying quality controls.

Every step, from grain mix to final inspection, is directed to uniformity of product. For example, while vitrified wheels are being fired, automatic recording analyzers keep sampling the kiln atmosphere to maintain desired oxygen content throughout the firing process.

RESULT: DEPENDABLE PERFORMANCE

You can *depend* on (PD) WHEELS because each reorder wheel gives you exactly the same good job as the original.

Using (PD) WHEELS you will find production going up, and costs going down . . . *to stay!* This is the promise —and the performance—of Positive Duplication.

CALL CINCINNATI TODAY

Solve your grinding problems with the help of specialists trained by the Cincinnati Milling Machine Company. Their wide experience in job set-ups and grinding operations is at your service.

Just call your CINCINNATI (PD) GRINDING WHEELS Distributor or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

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GRINDING WHEELS

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Look both ways when you buy abrasive segments —

Look at the segments. The "true segment" shape* was originated by Cortland especially for vertical spindle surface grinding. It provides a plow and shear action which results in faster stock removal, cooler cutting and better all around efficiency. Made in many different specifications to meet all job requirements in the various sizes which fit Cortland segmental chucks. We carry a wide range of "specs" in stock — or can tailor-make them to your requirements.

Look at the chucks. Cortland segmental chucks incorporate a simple, rugged design to facilitate mounting and quick segment change. They are light in weight and accurately balanced to promote smoother operation and reduce wear and tear on machine spindle bearings. Made in 16 standard sizes up to 48" in diameter to fit a wide variety of grinding machines.

Cortland engineers are prepared to arrange tests on your machines in your plants . . . and to prove that Cortland Abrasive Segments and Segmental Chucks will give superior performance on all types of surface grinding machines to which they have been applied. 21

*PATENTED

Write today for this brochure—or call your local Cortland representative.

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CORTLAND GRINDING WHEELS CORPORATION
Chester, Massachusetts

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ANOTHER NORTON PRODUCT

the New VIZI-DISC

lets you see your work while you grind. It cuts cooler and gives you pin-point accuracy

The unique shape of the METALITE VIZI-DISC gives it "see-through" like a fan blade or an airplane propeller. The operator can see right through the work area of the disc. Obviously, the intermittent action means cooler operation. Get a free demonstration of VIZI-DISC. Just call your Behr-Manning representative or write Dept. GF-6, BEHR-MANNING CO., TROY, N. Y., A DIVISION OF NORTON COMPANY.

BEAR BRAND

Coated Abrasives

Here is the VIZI-DISC mounted on a portable electric grinder, ready to run. Note the unique shape with parallel sides.

As the grinder starts, note the spinning pattern, similar to an airplane propeller or the blade of an electric fan.

Full rpm. With the VIZI-DISC there is no blind spot. You see your work while you work, as the grinder gets revved up.

A NEW *"COMPACT"* HITS THE MACHINE TOOL FIELD . . .

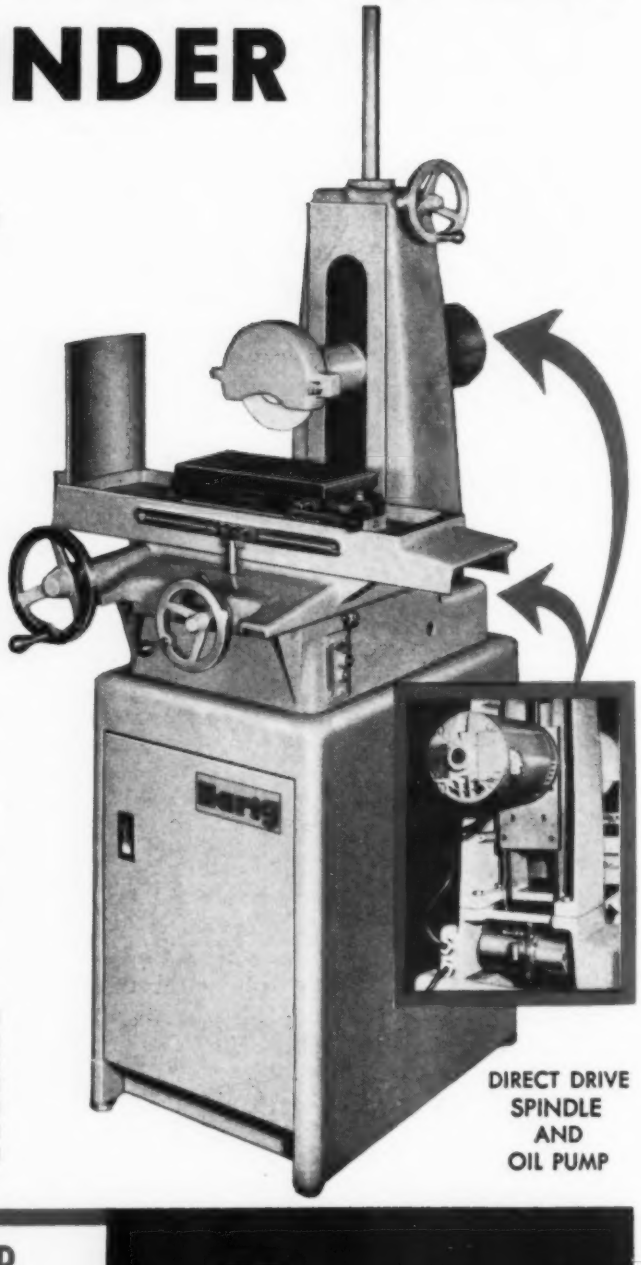
THE NEW HARIG 612 SURFACE GRINDER

with

* **Automatic forced lubrication**
  goes into operation as soon as machine is started — triples life of the ways and preserves original accuracy.
* **Direct drive spindle**
  increases power . . . reduces vibration . . . no V-belts to replace.
* **Your choice of right or left hand longitudinal feed**

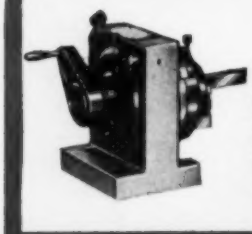
All Standard Equipment

The new 612 represents a break-thru in design and construction whereby Harig now offers industry a low-cost, precision surface grinder loaded with features usually found only on expensive models. Easy to operate . . . requires little maintenance . . . built with the precision quality you expect from Harig.



DIRECT DRIVE SPINDLE AND OIL PUMP

GET ALL THE FACTS . . .
Write for brochure on the Harig 612 Surface Grinder



HARIG'S NEW IMPROVED GRIND-ALL FIXTURE

Easily grinds irregular shaped perforators concentric with shank within ±.0001 accuracy. Also can be used as milling, boring and inspection fixture. NEW ATTACHMENTS: Radius Dresser Arm and Ball Seat Punch Adapter. (Write for new Grind-All Brochure.)

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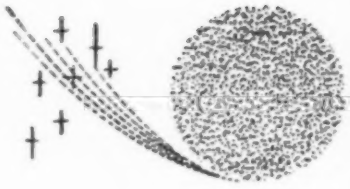


Ideas from the Shop

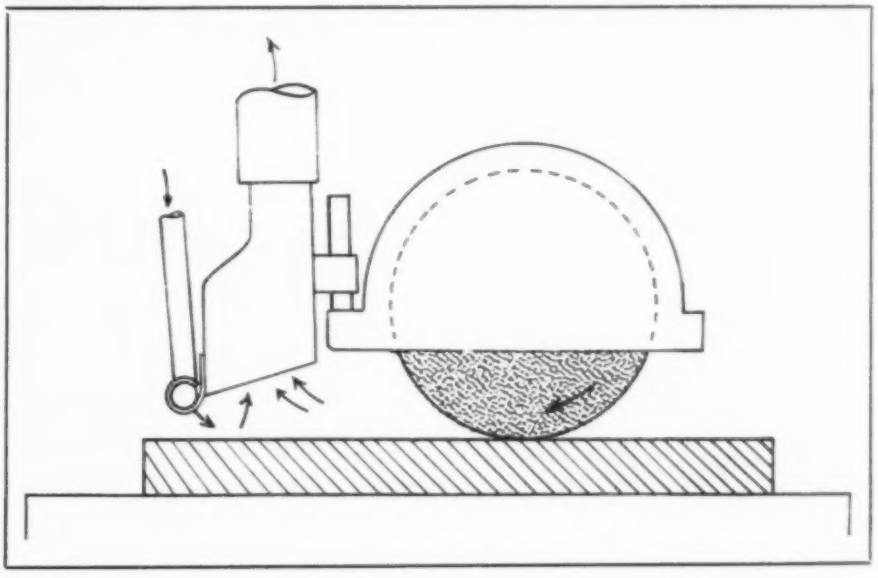
Improve Efficiency of Your Dust Collector

By Clifford Molloy

• We have several surface grinders in our tool room equipped with exhaust systems to pick up the grinding dust. We have found that even when properly adjusted close to the work, much of the dust escapes past the suction intake. The chips of metal and abrasive leave the wheel at very high speed and just fly past the air rushing into the intake.

In order to improve the action and the efficiency of this dust collecting system we added a short piece of ⅜" pipe on the edge of the intake as shown on the drawing. The outer end of the pipe is capped and compressed air is fed to the inner end through a flexible hose. This hose is necessary to permit the wheel head to be raised and lowered. A pressure control valve is used to control the air flow.

A series of holes about .015" is drilled along the center line of the pipe. The pipe is turned so the air is discharged down at an angle as shown in the drawing. These holes are spaced 1/16" apart. We use air at about 15 psi. This series of air jets produces a wall which stops the dust. When the air strikes the surface of the work, it reverses and flies up into the exhaust intake. We have found that this arrangement increases the efficiency of the system and at 15 psi it does not consume very much air. When experimenting with this setup, we found that the air flow is easily traced by blowing cigaret-smoke toward the exhaust intake.



Save Time, Cut Costs, Improve Service

By A. E. Salmone

• Many people do not like grinding or are afraid of it. The average toolmaker or machinist will grind his own tool bits on the hand grinder or he will take a finish cut for accuracy on the surface grinder. Anything else he will do on the miller even though it may take twice as long. Yet the grinding machine with the proper wheels and guards is as safe as any miller, shaper, lathe or drill press.

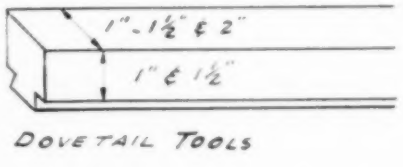
I have seen toolmakers take off 1/16 from flat stock on the miller. They had to install vise, line up work, install cutter and start removal of stock. They could have done this same job in half the time on the surface grinder.

It's a fact that you can do a lot of grinding in the time it takes to set up a miller, especially flat stock. Many similar jobs such as slots, grooves, steps and dovetails could be done on the surface grinder. In addition you have the advantage of a better finish with far greater accuracy.

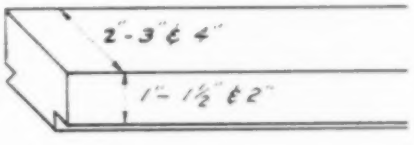
Many tools, jigs, fixtures have to be finish ground on the surface grinder, so if the stock removal is not too great you save time by eliminating one setup. In our shop we make automatic dovetail tools of the illustrated sizes.

They are made from high speed bar stock. They are shaped, dovetails milled in them, hardened and finally cut off into standard lengths. When these dovetails break in operation or when they are worn out we make them into smaller tools as shown.

We simply cut off or grind off the old dovetail and grind in a new one. It is a quick, accurate method. It cuts costs, improves service and saves time. The milling, shaping and hardening are eliminated. No high speed steel is discarded as we make still smaller tools



DOVETAIL TOOLS



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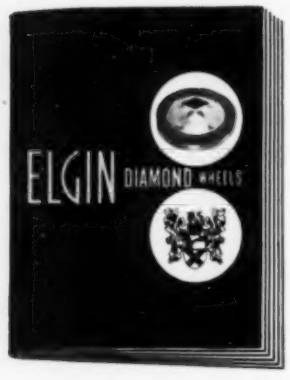
SPEED PRODUCTION...

REDUCE COSTS!

*Diamond wheels engineered to the job by your local Elgin field engineer.



Before you order *any* diamond wheel, talk to your Elgin man! His experience, backed by Elgin's broad resources, is your assurance of maximum production efficiency, quality of finish and long wheel life!

First select the style you need from Elgin's *complete* line of diamond wheels, then the Elgin man will help you specify the very best bond, grit, concentration, hardness and bond modification—and tell you whether to use *natural* or *man-made* diamonds.

Call your local Elgin Abrasives Distributor or Field Engineering Office today, or write direct to:

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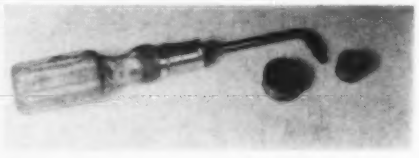
Ideas...

from smaller tools. Very often the old width becomes the new depth. With the cost of high speed steel we can realize a large saving in a year's time.

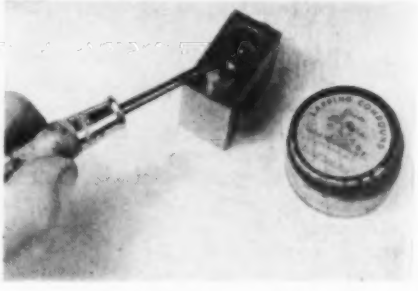
Copper "Button" Laps

By H. J. Gerber

• In the lapping of small flat surfaces on the lapping plate there is a tendency to develop a slight "crown" or high spot through the middle of the lapped area. For the purpose of lapping off this crown I use small button laps turned from copper bar stock. The small lap enables one to lap only a restricted area which has tested out to be high. This is often the case in the lapping of snap gages and the small laps are invaluable for this purpose.



The laps are turned and carefully faced on the lathe and may even be ground on the surface grinder by attaching them to the magnetic chuck with the pressure sensitive tape, gummed on both sides, now commonly available.



A small hole is drilled in the center of the round lap for the purpose of manipulating the lap with the illustrated handle. This handle was devised by simple modification of a discarded screw driver. The end of the cut-off shank was ground down in diameter to make a loose fit in the hole in the lap. This will allow the lap to rotate as it is worked over the surface. This rotation serves to equalize wear on the lap.

These laps, made in various diameters, will many times prove very useful on high precision "touch up" jobs on small tool items.

they turn in top performance to turn out top results

SIMONDS CENTERLESS GRINDING WHEELS

top rated for fast, free-cutting . . .
high production . . . long wheel life

"Ground 70,000 pieces compared to 45,000." "Held corners and shape better than wheels previously used." "Entirely satisfactory. Gave excellent finish." These comments from users* are some reasons why Simonds Centerless Wheels are rated superior for job-to-job dependability . . . and good reasons why *your* way to accurate, lower cost centerless grinding may lie in switching to Simonds Wheels. Write for bulletin ESA 55.

*Names on request.

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REGULATING WHEEL
Rubber bonded feed wheels exceptionally long wearing and have good traction . . . perfect mate for the Simonds Grinding Wheel.

GRINDING WHEEL
Job-proved Grain and Grade Specifications for all materials. Karvit bushed non-metallic center hole for better mounting and balance.

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ACTION'S PRESSURE → CAST BOND ←

U.S. Patent No. 2418529

. . . in an Electrolytic Wheel means built-in satisfaction

Action's patented Pressure Cast Bond is a development of many years experience and know-how in metal bonding. The result is an electrolytic wheel so completely homogeneous that it becomes the most ideal and efficient component to use in electrolytic stock removal.

Action's Pressure Cast Bond offers these advantages:

1. Assures top performance for non-mechanical, electro-chemical stock removal on conductive metals.
2. Increases life of electrolytic diamond and non-diamond (aluminum oxide) wheels.
3. Proper density provides perfect conductivity for electro-chemical stock removal reaction.
4. Experience tested on thousands of stock removal applications.

You are Invited...

to write for further information on the exclusive advantages of using Action's Pressure Cast Bond electrolytic wheels.

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Here's the quick, low-cost way to get any Controlled Surface Finish

Are you paying more than necessary to obtain *controlled surface finishes?* You probably are if Gisholt Superfinishing is new to you. You are losing time, money and paying a premium for quality as well, on many jobs.

With Superfinish you preselect the surface finish you need—as high as 80 or as low as 1 micro-inch RMS—and you get it faster, at less cost than by any other method. Rather than an expensive extra step, Gisholt Superfinishing actually eliminates tedious, more costly processes.

Not only do you save time and money, but you get a "controlled" surface finish, free of smear metal—with the true base metal exposed—one that provides greater area contact for heavier loads and longer life in your specific application.

Whether your job requires a 1, 20 or 80 micro-inch finish, setup is fast and easy. Nothing is left to the operator's skill or judgment. Stone pressure and grade, and reciprocation rate are preselected to produce the finish you require, for job lots or large production runs.

It will pay you to find out how Gisholt Superfinish can cut costs, improve quality and lengthen service life on your standard or problem parts. Ask your Gisholt Representative or write for Bulletin 1169.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

Investigate Gisholt's Extended Payment and Leasing Plans

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Lathes • *Factory-Rebuilt Machines with New-Machine Guarantee*

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ONE
has met the test

LORCO®
vibratory finishing equipment proved through 5 years of experience

Lorco posts the proof of performance you must have in selecting vibratory finishing equipment—five years of leadership in engineering, manufacturing and applying vibratory machines to all precision finishing requirements. Exclusive Lorco operating features make these the most versatile, efficient and effective vibratory machines available. Exclusive design features make Lorco equipment unequaled for durability and dependable, continuous operation.

Nearly 100 users of Lorco vibratory equipment, including many prominent plants operating multiple units, are now achieving results that would be impossible with any other mechanical finishing method. Processing time cycles have been cut as much as 90% in deburring, radiusing, stock removal, and surface-improving operations. Parts that are too fragile to tumble and those having shielded, recessed areas are being successfully finished to micro-inch tolerances, even on hard-to-reach interior surfaces.

Call on the unsurpassed experience of Lorco processing engineers for the solution to finishing your "problem" parts. Get all the facts from your Lorco representative.

WE'LL PROVE THE SAVINGS

you can make with Lorco vibratory finishing. Send for details of our *total* service in experimental precision finishing.

LORCO MEDIA AND COMPOUNDS, TOO

A complete line of natural and preformed media, chemical compounds for vibratory and conventional barrel finishing. Write for complete catalog.

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American Society for Abrasives

Chicago Chapter

Joseph Kessler, technical sales director for Van Straaten Chemical Company, was the speaker at the May meeting of the chapter, held on Thursday, May 12, at Nielsen's Restaurant. His subject was, "Effects on Grinding Operations of Differences in Water Soluble Grinding Compounds." Approximately 60 members and guests attended.

M. M. Patterson reported on the national convention at Pittsburgh.

Membership to date was reported as 102, with three more applications received at the meeting.

The June meeting, Thursday, June 9, will feature the election of officers.

Long Island Chapter

The chapter's May meeting was held on the 11th, with **N. L. Watkins**, products manager, Electro Minerals Division, the Carborundum Company, Niagara Falls, New York, as the speaker. The subject: Precision Barrel Finishing. The talk was concerned with techniques in barrel finishing, concentrating on short-run production set-ups.

New Jersey Chapter

Gerry Scheyer, plant manager of the Adamas Carbide Corporation, Kenilworth, New Jersey, spoke on the application of diamond wheels and coolants, as applied to the grinding of tungsten carbides, at the May 18 meeting of the chapter. The group met at the Blue Shutter Inn, Union, New Jersey. The talk was illustrated by slides, and a question-and-answer period concluded the discussion.

The April meeting was held at Neville's Ranch House, Kenilworth, New Jersey, with **C. D. Cummings,** sales manager Allison-Campbell Division, American Chain & Cable Company, Inc., Bridgeport, Connecticut, as speaker, on the subject, "The Theory and Practice of Cut-Off Grinding."

Jack O'Sullivan and **Jim Chamberlain** reported on the national convention.

New Chapters

The presentation of a charter for Cleveland, the fourteenth chapter, at the national convention may well spark a record-breaking year in chapter organization.

While Cleveland reportedly has about 100 members, they would welcome more. **Joseph Cognata,** Cleveland Twist Drill, the president, is the man to contact.

Gene O'Connor, of O'Connor Abrasive Sales, Buffalo, New York, is reported to be interested in forming a chapter in the Buffalo-Niagara Falls area. With the area's diversity of industrial plants and its large representation of abrasive manufacturers, there should be a nucleus for a large and active organization.

Indianapolis, Indiana, has been rumored to be "in process," too. Prospective members in that area should contact American Society for Abrasives, 120 North Fifth Street, Reading, Pa.

Seventy-five members of the Connecticut chapter visted the Fuller-Merriam Company plant, West Haven, Connecticut, on the afternoon of March 28. Harley J. Hiscock, company president, is shown greeting Patrick Pascucci and directors of the chapter, during the visit. From left to right are James D. Earley, vice president, Fuller-Merriam; Stanley J. Bozek, vice president, and Robert G. Carpentier, director and past president, of the chapter; Pascucci; Charles Sadler, chapter treasurer; Hiscock; Bert Broekhysen, secretary; Howard E. Swatkins, director and past president, and Felix Bresh, director, of the chapter.

GRINDING and FINISHING Subscriptions for ASA Members

Receiving GRINDING and FINISHING as a result of ASA membership has been a long-standing question, dating back to the inception of the society. It was clarified at the national convention by **M. M. Patterson,** managing editor.

Free subscriptions can be sent only to ASA members who are users of abrasives and qualify as prospects for products advertised in the magazine. This is required by the Business Paper Audit of circulation figures for the solicitation of advertising.

A special subscription rate of $4.50 per year, however, instead of the regular $6.00, is offered to all other members in good standing.

BELLOWS-AIRBORNE *Electronic* INFEED GRINDER CONTROL SYSTEM

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Design for Grinding

RICHARD L. McKEE • Associate Editor

Tracer Head Aids Contour Grinding

Modification on standard grinder cuts time, equipment for sharpening contours.

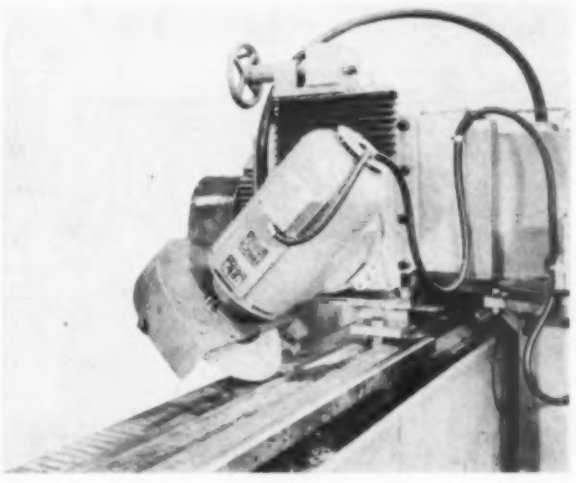
● An economical and flexible method of combining heavy stock removal face grinding with secondary contour cuts has been developed in a machine designed for sharpening rotary crop shears. Mattison Machine Works, Rockford, Illinois, now equips its standard No. 2000 traveling-table face grinder with an auxiliary swiveling head for contour sharpening. The auxiliary head floats laterally and is controlled by a tracer to reduce part-handling time and costly special equipment for grinding complex work.

Rotary crop shears utilize a male and female blade to cut a large radius at the leading edge of steel slabs for easier feeding into the rolling mills. Either a male or female blade die may be placed on the new grinder, and two compound angles of the shear blade sharpened simultaneously in a curvilineal plane at the cutting edge of the knife bar. A combination of counterweighting and anti-friction spindle-carriage mounting permits the wheel to follow the desired shape, as controlled by a roller cam moving along the template.

To provide antifriction mounting, one set of hardened steel balls is mounted between two V ways at a 45° angle to support weight of the swiveling head, while another set is wedged between two opposed V ways in the horizontal plane to absorb thrust loads.

The auxiliary head is easily dressed by two manually operated dressers mounted on a special base at one end of the table.

The hydraulically driven table on the Mattison No. 2000 is pulled in both directions by two opposing cylinders to provide uniform, smooth travel.



Combination of counterweighing and anti-friction carriage mounting allows the wheel to follow the desired shape, as controlled by the template.

The outer way is flat, while the V-shaped inner way takes lateral thrust and guides the table. This design assures excellent finish and accuracy when grinding shear blades, wear strips, and similar parts.

The Mattison No. 2000 face grinder with auxiliary tracer head handles work lengths ranging from 50" to 220". Spindle may be driven by motors of from 25 to 40 horsepower.

Any flat part that requires a combination stock removal facing cut and a contour finishing operation can be put on this machine. Straight, flat surfaces and contour edges or faces can be machined in two easy setups. • • •

EXECUTIVE QUARTERS FOR GRINDERS PAY OFF

● Management of every company manufacturing a precision product knows the value of skilled craftsmen and the importance of maintaining a high level of product quality. This is especially true of Magnetic Metals Co., Camden, N.J., where the increasing demand for more magnetic-core parts for modern communications and electronic-control equipment, as well as the trends toward miniaturization, has emphasized the need for attracting and holding skilled die makers and grinders.

Convinced that good working conditions foster higher standards of workmanship and loyalty, the company began remodeling its tool room in 1956. To make working quarters comfortable, and at the same time conducive to high quality production, Magnetic Metals constructed "executive quarters" for each surface grinder, placing the men in their own individual offices.

The company began with a single experimental booth, then made improvements developed from the suggestions of the skilled workmen, each of whom used it for several months during a two-year test period. The result has been the completion of clean, private and quiet work quarters for each grinder. In addition to providing individual "executive" offices, which are contributing to product quality, the grinders have the satisfaction of having had their wishes incorporated in the final design and structure.

When the men first used the experimental booth, they missed the sounds and personal contact of the conventional tool room. They felt "lonely." The solution was installing large double-pane "picture" windows so that the booth was soundproof and still gave them visible contact with their neighbors.

Soundproofing not only eliminated distraction, but has enabled grinders to better hear the "kiss" of the grinding wheel as it contacts the tungsten

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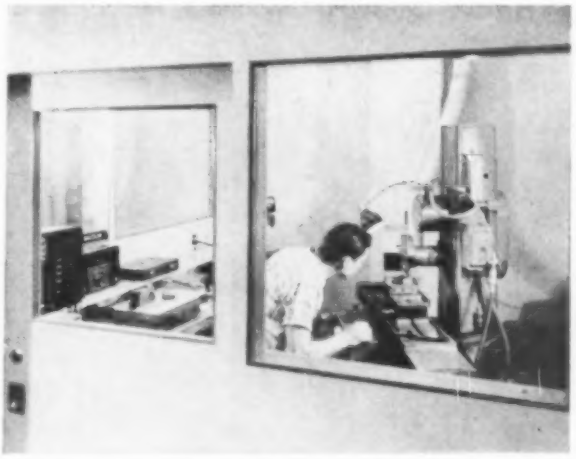
carbide, from which Magnetic Metals makes most of its precision dies. Work, on which tolerances of .00005" are not unusual, is also aided by a luminous ceiling of high-output fluorescent lighting, which is uniform and shadow-free.

Each "office" has individually-controlled air conditioning, with an automatic air mixing unit which filters and recirculates cooled air, while eliminating drafts and dust.

Roomy and comfortable, each booth is equipped with an individual grinding machine, work bench, gauging equipment and special tools and fixtures. Every craftsman has his own nameplate on the sliding door to his office, which can be locked, eliminating loss of time in setting up jobs or getting out tools. Each man was given his choice of stool or chair, and may have a personal radio.

Magnetic Metals' consideration of its surface grinders and the carefully engineered work quarters it has provided for them extends to other parts of the plant. The latest inspection devices and modern metal turning and boring machines are used to produce the highest standard of precision dies. And a rigid maintenance schedule for lamination-stamping equipment is part of the company's normal production practice. In addition to sharpening dies when they deviate beyond .0001" from specifications, dies, which can represent an investment of as much as $25,000 in materials and workmanship, are stored in a bomb- and moisture-proof vault. This protection not only preserves the result of skilled craftsmanship, but also holds dies ready to be placed into production at a moment's notice.

• • •



Craftsman at work in his own private quarters. Each shop office in Magnetic Metals Company's new tool room has individually-controlled air conditioning, complete soundproofing, and a luminous high-output fluorescent ceiling. In addition to a grinding machine, gauging equipment, and special tools and fixtures, every surface grinder has his own nameplate on the door, his choice of a stool or chair, and may have a radio in his office.

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Blast Cleaner Returns Cost in 8 Months

● In 1951, Compton Foundry, Compton, California installed a modest size all-purpose blast cleaning table-room and cut their cleaning costs by $8,628 a year. At this rate the new equipment paid for itself in approximately eight months time, and savings have been accumulating at the rate of $719 every month ever since. Not bad for a foundry averaging 110 tons of castings a month!

The blast cleaning equipment—a 6 ft. Rotoblast® table-room manufactured by Pangborn Corporation, Hagerstown, Maryland—has paid for itself many times over. It is still in excellent operating condition, still turning out what customers label "the most beautiful castings we've seen".

This table-room has been saving $719 per month since it was installed.

Here is the arithmetic at Compton Foundry:

Labor Costs: Prior to installing the new blast cleaning equipment, Compton required two full-time workers and one man half-time to handle the casting cleaning job. Now one man takes care of the job with the resultant labor cost reduction of $519 a month.

Abrasive: Abrasive costs were cut from $200 to $70 a month—due to the faster cleaning and more efficient abrasive recycling equipment.
Maintenance: Maintenance of previous equipment, formerly $150 a month, is now $80 a month including all labor and replacement parts.

But the facts and figures on labor, abrasive and maintenance cost do not tell the full story; the benefits do not stop there.

Quality of cleaning, for example, is incomparably better; this makes inspection easier, surer, adds substantially to quality of product. Better appearance improves salability. There were noteworthy savings in floor space and entire operation is faster, easier, cleaner—contributing to improved employee morale and lower plant housekeeping costs.

Compton's blast cleaning machine is the "table-room" type, considered to be the most versatile single blast cleaning machine available: it handles castings or weldments varying considerably in size, shape and weight—from less than a pound up to 5000-lb. pieces 6'0" diameter and 3'0" high. • • •

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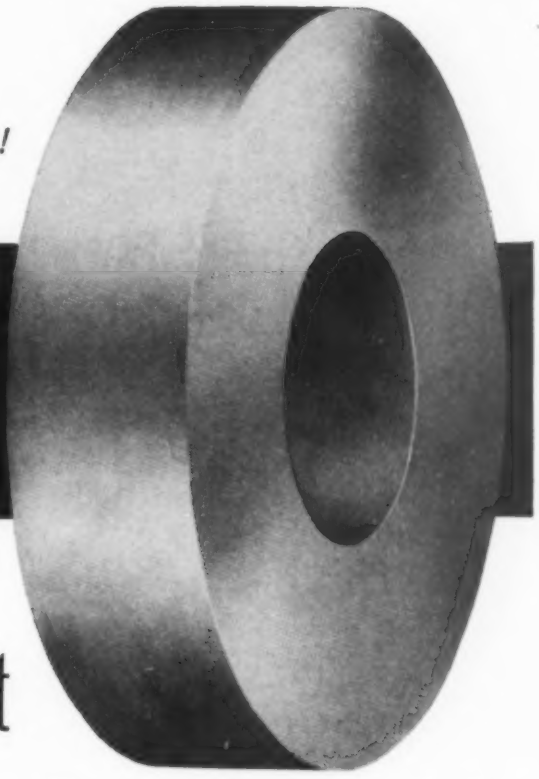

This 1⅛" dia. x ½" steel roller was production ground to lapped tolerances in a BESLY DH4 grinder at a rate of 240 per hour. Size was held to ± .0001", flatness and parallelism to .000075", finish to better than 4 micro-inch. Stock removed was .0004". *Normal lapping operation was eliminated!*

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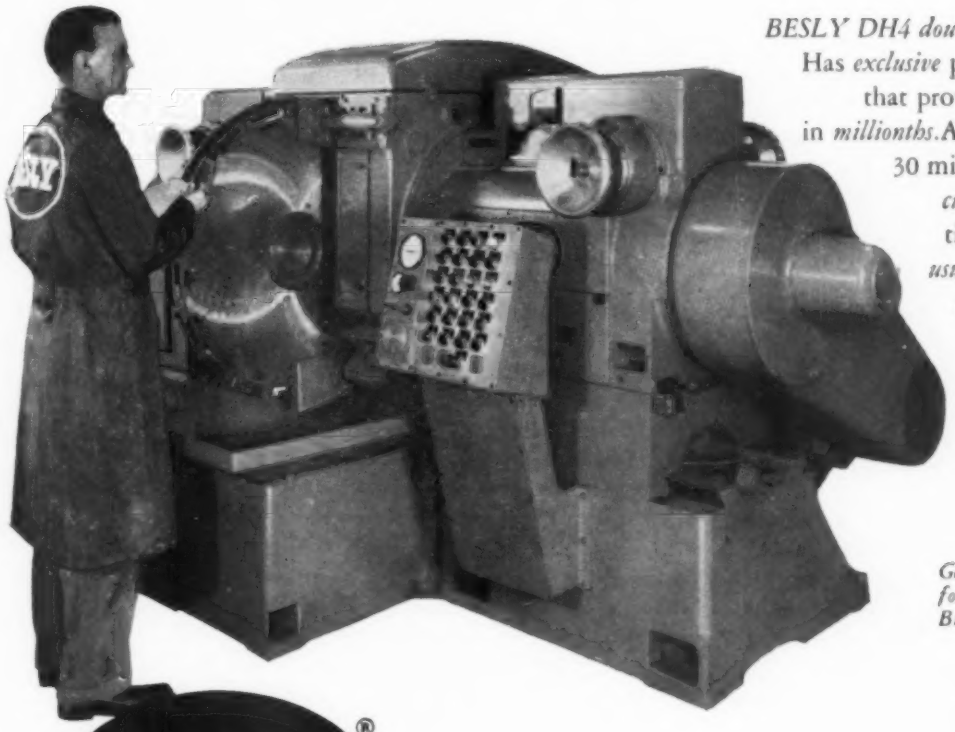

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Should You Use DISC GRINDING?

Double spindle disc grinding is a versatile, high production method, readily automated, for generating flat parallel surfaces on a wide variety of piece-parts.

By LEO E. JACOBS, President, and
FRANK O. SHOEMAKER, Technical Director
Titan Abrasives Co.*

● Disc grinding has come a long way since man first glued a piece of emery cloth to the face plate of a lathe and used it to touch up small steel tools and parts. The method has found much wider use as people have become more aware of its possibilities.

Basically, it consists of grinding the flat side or sides of a piece-part on the flat side of a grinding wheel mounted as a disc. Originally most of this type of grinding was done on single discs. Now, most applications involve a double opposed-disc machine, with two spindles, each supporting a disc on one end, and mounted so that the discs can grind opposite and parallel sides or ends of a piece at the same time.

In most machines today the spindles are horizontal, and the discs rotate in a vertical plane. There are, however, quite a number of vertical spindle machines as well.

It was the introduction of the first successful bolted-on abrasive disc, by the Besly-Titan organization in 1927, which took the disc grinder out of the realm of makeshift and made it a precision machine tool.

In size, abrasive discs range up to 6′ in diameter, though probably 20″, 30″, 42″, and 53″ discs are most widely used. Many are molded in one piece, but sections are common in the larger sizes. In either case, the flat grinding surface is generally interrupted either by grooves, to aid in carrying the coolant to the working surfaces, or by perforations, to help the grindings escape.

Disc grinding is unique among abrasive methods because of the large area of surface contact involved. This factor tends to increase the rate of stock removal and facilitates the generation of flat surfaces, but it also brings problems in applying coolants and in disposal of the sludge or swarf. Work holders are also important, because the pieces must be kept in motion. In through-feed grinding, the parts are simply pushed between the discs on guides which are thinner than the parts, entering on one side of the machine and dropping out on the other. This is widely used for piston rings, valve seat inserts, carbon brushes, meter discs, hydraulic pump parts, and similar workpieces.

A second type of work holder is one which inserts a single workpiece between the discs, oscillates it during the grinding cycle, and then retracts it for unloading. While this is obviously a much slower method, it is useful where tolerances for flatness and parallelism are extremely close.

The third type is the so-called "ferris wheel," which carries the parts through the grinding zone and out to the same side of the machine. Often the work is simply inserted in properly-shaped holes in the carrier, and drops out when it has been ground. When only one end of the workpiece is to be ground, two may be clamped in a thicker variation of this type of holder, with the surfaces to be ground projecting on either side, and ground at the same time.

Sometimes, as in the case of automotive valves, the pieces are alternated in the feed wheel.

Or one half of a double spindle grinder may be used if only one surface of the piece needs to be ground. This is a much more accurate setup than a single spindle lever table type disc grinder, and should not be confused with it.

Double disc grinding of the faces of inner-outer races and cups and cones. Tolerance is held to .0003″ so that the remaining operations can be located from the faces. (Photo courtesy of International Harvester)

Probably the best way to look into the potentialities of double disc grinding is to review some of its major applications.

For instance, prior to World War II most piston rings were roughed and semi-finish ground on double spindle disc grinders, but finished on a rotary surface grinder. Attempts to complete the grinding on discs met with resistance, because it was felt that the resulting criss-cross pattern was less desirable than the concentric scratches left by the surface grinder. When it was decided that aircraft piston rings should be lapped on the flat surfaces, and when ground rings lapped out six times as fast as rings ground on a surface grinder, it did not take long to change the method. Before the end of the war practically all rings were finished on double spindle disc grinders, and this is the current situation.

With automotive size rings ground at the rate of 400 passes per minute on 30″ and 42″ grinders, the savings in labor, abrasive, and machine upkeep becomes obvious.

For many years the outer and inner races for ball bearings had been ground on rotary surface grinders using a cylinder type wheel and magnetic chuck. Many of these parts are thin in cross section and easily warped in heat treatment; a number of passes were required to make flat pieces. Double spindle disc grinding is now generally used, again resulting in a better product with great savings in labor, abrasive costs, and similar items.

In an application like this, where the surfaces to be ground differ in area, there is a tendency to grind more stock off the narrow edge than off the wide one. Some bearing makers use a harder and finer wheel on the narrow edge to equalize the rate of stock removal, while others use the same discs on both spindles, but vary the speed so that one acts much harder.

Inner and outer ball bearing races of sizes commonly used in automobiles are ground at a rate approximating 5,000 pieces per hour per pass. Since each race requires more than one pass, hourly production is, of course, below that figure.

Many disc grinding operations are wet, but the grinding of the ends of coil springs, one of the largest applications other than those previously mentioned, is usually dry—at least in sizes used for automobiles.

Originally these springs were placed in a wooden holder and oscillated by hand between a pair of 20″ discs. Power oscillated fixtures and rotary (ferris wheel) feeding devices succeeded the wooden holders, while the disc size went to 30″, then 42″, 53″, and finally to 72″ diameters.

In the 53″ and 72″ sizes, the discs always run in vertical position. Smaller discs, 12″ to 42″ in diameter, may run either vertically or horizontally. The latter—a vertical-spindle machine, of course—has the advantage of using gravity to help eject the springs.

Still another improvement is to use a four-spindle machine with a common feed wheel. One

pair of discs rough-grinds the springs; a second pair, usually of a different grade and grain size, completes the finish grinding. Handling time is cut in half, and the springs get a chance to cool off between grinds.

Automotive valve springs are ground on a 30" tandem vertical spindle spring grinder (four discs operating with a single feed wheel) at a rate of 2500 springs per hour.

Double vertical spindle grinders are also used on small plastic parts, stainless steel washers, and ceramic parts, where feeding and removal of ground parts is greatly simplified by gravity.

A popular type of single vertical spindle grinder employs a 36" or 42" disc running in a horizontal plane over a 48" to 80" feed wheel. Larger Alnico magnets, mower sections and guard plates for mowing machines, replaceable parts for plows, and blades for inserted tooth milling cutters are a few of the items ground on this type of machine.

Grinding circular parts for hydraulic pumps used in power steering for automobiles is another unique application. As each part must get exactly the same treatment, only one is finish ground at a time, and to be sure the discs stay straight and flat, each piece is passed completely through the machine, entering at the front and leaving at the back. Work is held to .0002" for size and .00005" for parallelism and flatness. A series of machines connected by suitable feeding apparatus are employed for roughing, semi-finishing and finishing. Net production is 250 pieces per hour, with 100% of the parts within the limits mentioned and less than 10 microinch finish.

For many years high speed steel round bars have been centerless ground at the mills. The customer gets steel free from decarburization; any defects in the steel are quickly evident; and the mill can sometimes salvage bars by grinding them down to a smaller size. Now the double spindle disc grinder grinds flat, rectangular or square bars of steel, titanium and other metals, thru-feed, in much the same fashion. Most progressive tool steel mills can now furnish this type of product.

Where bathtub castings used to be snagged around the outside edges with small portable wheels, they are now finished in about one-sixth of the time on the disc grinder.

Shown here are a few of the typical parts ground on disc grinding machines.

In the field of non-metallics the disc grinder is also useful. Ceramic tile are sized by the million. Glazed terra cotta tile and concrete building blocks are brought to uniform size. With the increased use of oxygen in open hearth furnaces generating tremendous heat, much denser, harder refractory bricks must be used in the lining, and the cement joints kept to a minimum. As a result, this refractory brick is now ground to size on double disc grinders.

As a general rule, resinoid discs in grain sizes 16 to 46 are used for roughing, and in grain sizes 60, 80 and 120, for finishing. Silicon carbide is used for non-ferrous and non-metallic applications, and aluminum oxide for ferrous metals. Cast iron, brass, aluminum, and other soft metals can be roughed satisfactorily with 16 to 46 grain discs, with excellent finish requiring something in the 80 to 120 grain range.

However, on hardened steel and alloys on the order of 60-65 Rc, a 60 or 80 grain disc will produce a satisfactory finish. In fact, at times it is a problem to get the abrasive to bite into the work, and the finish is better than required.

Because in most instances a disc grinds all over a single surface of the piece-part, the disc must be softer and more open than a wheel for peripheral grinding of the same material. For a starting point, two grades softer and two structure numbers more open would be a good recommendation.

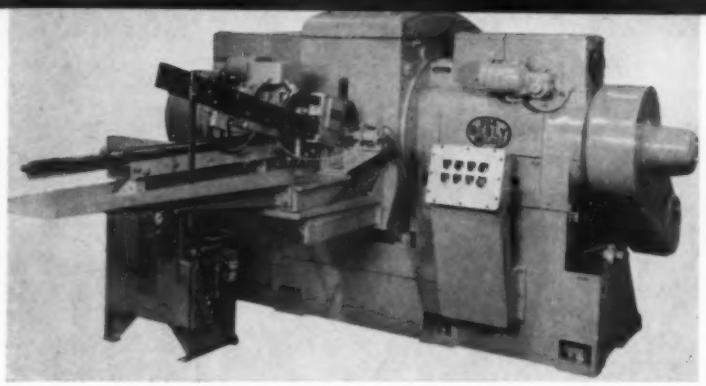
CRITERIA FOR DOUBLE SPINDLE DISC GRINDING

If a piece meets the following standards, it warrants consideration for double spindle disc grinding:

(1) Two parallel flat surfaces, or matching flat surfaces of two pieces.
(2) High production.
(3) Continuous area to be ground less than 8"x12" (metal) or 12"x24" (non-metallic). However, flat surfaces even larger than these may often be relieved to bring them into the range of double discs grinding.
(4) Metal bars of any length as long as they are not too wide in relation to thickness.
(5) The surface to be ground must be an outside plane. Depressed or relieved surfaces cannot be ground on a double spindle disc grinder.

Resinoid is the most commonly used bond in discs, even with its previous tendency to soften from the action of strong coolants. However, with the development of coolant-resistant resinoid bonds (see "Waterproof Grain Enlargers Resinoid Applications," by W. A. Mohun and O. L. Forchheimer, GRINDING and FINISHING, May, 1959) it is not unusual to find resinoid-bonded improved grain and bond giving up to four times the previous life.

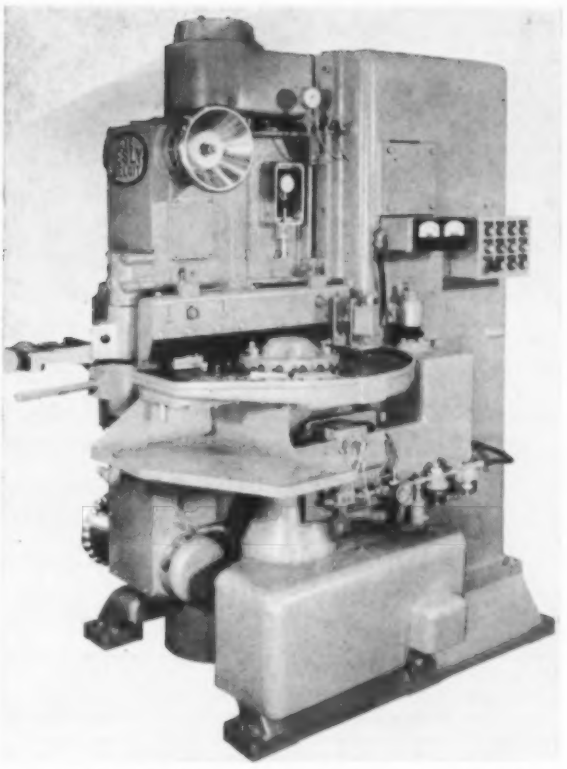
As a starting point, a disc speed of 5,500 sfpm is suggested, though the speed of the abrasive across the work will fall and then rise again as the piece travels between the discs. This happens with all three methods of feed. The speed of the discs, the feed rate, the direction of rotation of the discs—they may travel in the same direction at the same speed, in opposite directions at the same



speed, or in either direction at varying speeds—these are matters to be worked out with individual applications.

To sum up: Double spindle disc grinding is a high-production method for generating parallel flat surfaces. Generally speaking, the solid area to be ground should be less than 8"x12" in metal or 12"x24" in other materials, because the problems of coolant supply and disposal of grinding swarf become critical. However, if the surface can be relieved, larger pieces can be handled. Length of a piece—metal bars, for instance—is not a problem as long as it is not too wide in relation to its thickness. Only the outermost surfaces of a piece can be ground. Anything below or inside these planes must be finished by other means. It is important to keep the work moving across the face of the disc. If it is oscillated, the movement should be as rapid as possible, and the work must clear both the periphery and the center hole of the disc. At least two-thirds of the workpiece must remain in contact with the discs during the grinding cycle.

In double spindle disc grinding there is no distortion from rigid mechanical or magnetic clamping. Thus it produces flatter surfaces than any other method of grinding. • • •

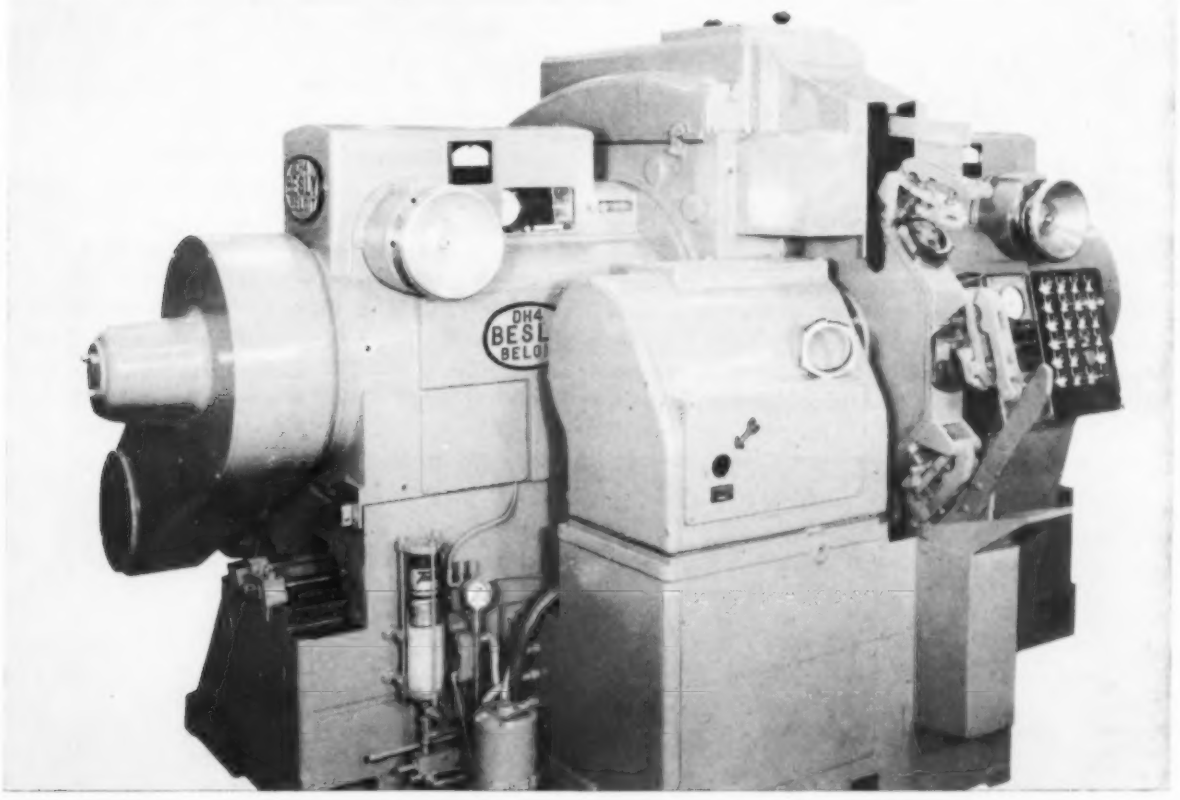


Above Left: Double spindle disc grinder with long stroke and pusher feed.

Above: Double vertical spindle disc grinder with rotary feed for grinding carbide inserts.

Below: Double spindle disc grinder with rotary cam clamping fixture for grinding pump slide for automotive transmissions.

*Titan Abrasives Co. is the manufacturer of Besly-Titan abrasives for Besly-Welles Corporation.



For Production, Economy, Flexibility...

ABRASIVE CUTTING

Part II

Abrasive wheel recommendations, work holding, case histories, and general considerations which favor abrasive cutting over alternate methods are the major topics of the concluding part of this two-part series on abrasive cutting.

By HOWARD T. BIECHELE
Allison-Campbell Division
American Chain & Cable Company, Inc.

● Since the grinding wheel is the heart of the abrasive cutting process, wheel selection is of utmost importance. It is true, of course, that the final selection for a given application depends on a number of factors peculiar to that application. Discussed below, however, are a number of general factors to be considered in picking cut-off wheels.

WORK HOLDING

Because of the variety of shapes and sizes of work to be cut, the method of holding should receive careful attention. The work must be clamped rigidly to prevent movement, and the clamps so arranged that they will not distort the work as the cut progresses, possibly causing binding and wheel breakage. Clamps should be located as close as possible to the cut, but on wet cutting machines, care should be taken that the work clamps do not interfere with coolant applications.

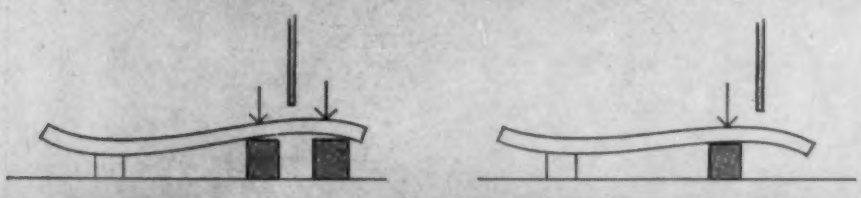
Rigid clamping on one side of the cut will suffice for many operations where extremely accurate tolerances and minimum burr are not required. When cutting crooked billets, or irregularly shaped material, it is recommended that the work be clamped only one one side of the cut, and that the work support on the other side be relieved to permit the cut off piece to fall away freely when the cut is completed. This eliminates the danger of pinching and breaking the wheels.

If more accurate cut-off tolerances must be held and if burr must be kept to a minimum when cutting straight stock, tubing, or structurals, it is absolutely essential that the work be clamped rigidly on both sides of the cut.

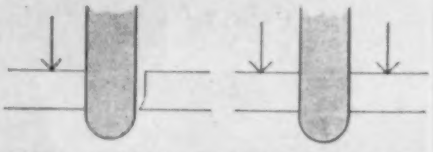
Work supports on the feed-in and run-out sides of an abrasive cut-off machine should be at exactly the same height, or every slightly lower than the work-holder in the machine to prevent pinching as it nears the bottom of the cut.

ABRASIVE CUTTING WHEELS

Abrasive cutting wheels are available in a great variety of formulations. Basically, rubber-bonded wheels are used for wet cutting, and resinoid-bonded wheels are utilized for dry cutting operations. Variations of the type and size of abrasive, the type of bond, or the relative amounts of bond and abrasive have a marked effect on the performance of an abrasive wheel. So it is essential



Clamping pressure applied to a crooked bar on both sides of the wheel may cause "pinching" and breakage of the wheel. The material will have a tendency to close in on the wheel as the cut is completed.



For smooth, clean cuts on some materials, the work piece should be rigidly clamped on both sides of the cut, as shown at the right. If the cut-off piece is free to move, burr may form, as shown at the left in this sketch.

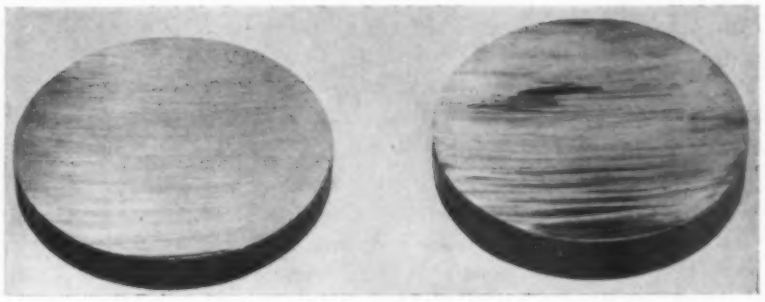


Illustration shows two pieces cut from the same 4-in. diameter bar of steel. Badly burned cut on right was made with a normal resinoid wheel and required 30 seconds cutting time. The piece on the left is almost burn-free. It required only 28 seconds to sever it with a rough-sided wheel. Both abrasive wheels were identical except for side-surface treatment.

that the cutting wheel be selected to fit the requirements of the particular job.

Generally speaking, wheels with silicon carbide abrasive are best for non-ferrous metals, glass, ceramics, plastics, and refractory materials. Aluminum oxide abrasive is best suited for the cutting of the ferrous metals.

Abrasive wheels for all cut-off requirements are available in a variety of sizes and specifications to meet specific job needs. The most popular sizes are shown in the table below.

RESINOID BONDED		*RUBBER BONDED*	
Diameter	*Thickness*	*Diameter*	*Thickness*
24"—26"	*7/32"*	*34"*	*7/32"*
16"—20"	*1/8"*	*24"—26"*	*5/32"*
10"—16"	*3/32"*	*18"—20"*	*1/8"*
6"—10"	*1/16"*	*10"—16"*	*3/32"*
		6"—12"	*1/16"*

Thinner wheels are sometimes desirable, and can be made in certain specifications. The thinnest wheels in common use are the 3-in. diameter by 0.006-in. thick rubber bonded wheels used for cutting the slits in pen points.

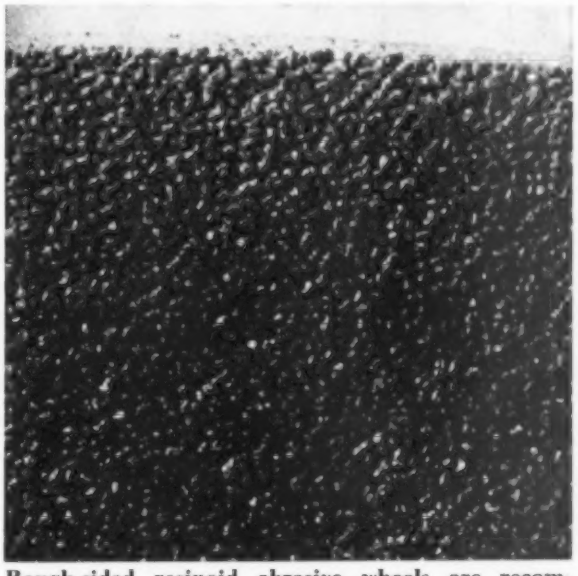
Coarse grit wheels provide the fastest cutting on most solids. This faster cutting means cooler cutting because there is less time for heat to build up, and the result is longer wheel life and reduced possibility of surface hardening. An exception to this rule is in the cutting of extremely hard materials by the wet method of abrasive cutting. In this case, a fine grit wheel will usually give the best quality of cuts.

For tubing, a coarse grit wheel may give maximum wheel economy, but it may also cause a heavy burr. A fine grit wheel, on the other hand, will produce cuts with little or no burr. The elimination or reduction of de-burring costs, therefore, can result in substantial savings.

The "grade" of an abrasive cutting wheel refers to the ability of the bond to retain the abrasive particles which perform the cutting. As an abrasive particle, or grit, on the cutting edge of the wheel becomes duller, cutting pressures build up to the point where the dull grit is torn loose, exposing a new and sharp abrasive particle.

A hard grade of wheel is one in which the bond is strong enough to retain each particle of abrasive

To cut tubing, use a fine grit wheel. With a coarse grit wheel and small arc of contact, few abrasive grains contact the work at a time. Each grain penetrates deeply, tears out big chips, and therefore throws a heavy burr. With a fine grit wheel, many abrasive grains contact the work at all times. Penetration of each grain is shallow, cutting smaller chips and producing less burr.



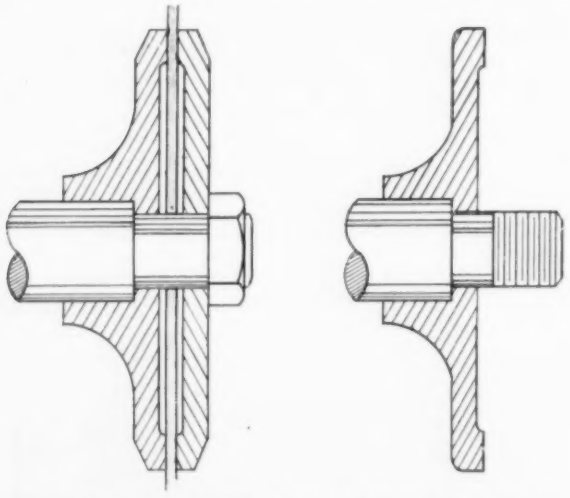
Rough-sided resinoid abrasive wheels are recommended for dry cutting of large solid cross-sections with minimum burr. One type of a rough-sided wheel is shown in this close-up illustration. Note how the abrasive particles actually stand out from the side of the wheel.

To cut solids, use a coarse grit wheel. With coarse grit wheels and a large arc of contact, enough abrasive grains contact the work at all times so that depth of penetration is not excessive. Metal is removed rapidly, and burr is kept to a minimum. With a fine grit wheel and the large arc of contact, too many abrasive particles contact the work at all times.

When cutting tubing or small diameter stock, a wheel that wears to a rounded edge tends to push the last bit of metal ahead of it, leaving a heavy burr. A wheel that wears to a square edge leaves a medium burr. By the same token, a wheel that wears to a concave edge tends to cut the kerf away completely, leaving only a feather-light burr.

until it becomes extremely dull before being torn loose. A hard wheel will, therefore, wear down slowly and give the maximum number of cuts per wheel. However, the rate of cut and the quality of cut may be sacrificed.

A soft grade of wheel, on the other hand, is one in which the bond is relatively weak and permits each particle of abrasive to be torn away as soon as it becomes slightly dull. A soft wheel will, therefore, wear down far more readily. It will generally cut faster and give better quality of cuts because the abrasive presented to the work is always sharp. Intermediate steps in wheel grade provide the desired balance between quality of cut and economy for any given job requirements.



Wheel flanges should be relieved so that only a narrow band around the periphery of the flange grips the wheel. Worn flanges are a major cause of wheel breakage. They cannot adequately support the wheel, and in extreme cases may actually distort the wheel so it cannot run true. Whenever chronic wheel breakage occurs, the wheel flanges should be inspected, and refaced or replaced if necessary.

CASE HISTORIES

From the pioneer methods of a generation ago, abrasive cutting has evolved into a major production tool by providing a fast, economical method of cutting virtually all materials including high temperature, corrosion-resistant alloys, some of which cannot be severed by any other known means. Here are a few cases in point:

A manufacturer of power plants for rockets and missiles reports the following results while using an oscillating type wet abrasive cutting machine equipped with a 26" diameter by 5/32" thick wheel to cut 6" diameter bars of Inconel X. Comparisons are against the cut-off method previously used.

A midwestern farm tractor manufacturer reports:

Material Used:	Submerged type Wet Abrasive Cutting Machine.
Wheel Used:	16-in. dia. by 3/32-in. thick with radial holes.
Material Cut:	Steel axles and gears having a hardness of Rockwell C40 to C60.
Comments:	These materials are cut without disturbing the surface structure of the metal, thereby permitting accurate metallographic examinations.

ABRASIVE CUTTING RECOMMENDATIONS

In general, and to summarize, in order to obtain the best possible results in abrasive cutting operations, the following suggestions should be closely examined.

1. When considering the desirability of cutting abrasively, don't neglect the possibility of greatly reducing production costs due to this method's ability to cut hardened, unannealed material with fine finish and to accurate length. Elimination of an annealing operation, finish grinding, milling or de-burring will result in substantial cost reductions.
2. Choose dry, wet or submerged abrasive cutting on the basis of availability, initial cost, wheel and labor costs. Don't overlook the cost of finishing operations which may be required or eliminated by the method chosen.
3. Select the type of machine — chopstroke, oscillating, horizontal or rotary — best suited to the materials and job requirements. No one type of machine will perform perfectly on all types of cutting operations.
4. Pay particular attention to the design of work holders and keep them in first-class condition. Accurate cutting cannot be maintained with misaligned or worn work holders that permit movement of the work while the cut is being made.
5. Use only an abrasive wheel designed to meet the requirements of your particular operation, considering the type of machine, quality of cut desired, and cost per cut. It's just as much an engineering problem to select a satisfactory abrasive cutting wheel as it is to select a milling cutter or other metal-cutting tool.

The proper application of abrasive cutting methods will return significant savings to the user. These savings will be seen in reduced costs for preparation of material to be cut, in reduced time per cut with resultant increased production rates, in finish quality where de-burring can be reduced or eliminated entirely, and in manufacturing space where abrasive cutting machines supply production rates out of all proportion to their size or number.

Modern abrasive cutting is helping to meet the ever-present demands of industrial growth in a nuclear age. • • •

The first part of this series, which appeared in the May, 1960, issue of GRINDING and FINISHING, covered the abrasive cutting process, types of machines, and wet and dry cutting.

SAM SAFETY says:

No. 10 of a series • GRINDING and FINISHING • *A Hitchcock Publication* • 1960
For single copies, circle No. 100 on the Reader Service Card, p. 51. For quantity prices, see Item 100, p. 59.

Wheel Testing

How - When - Why

There have been a number of requests by you, the reader, for this article on wheel testing. In these pages we have presented an answer for these requests which generally cover testing procedures by type of operation.

GRINDING and FINISHING STAFF

● Grinding wheels are unique among metalworking tools in many respects. They are efficient only when they are wearing out. Since they are available in thousands of different specifications, a slight variation in wheel specification usually means a significant reduction in grinding costs.

To help the user of grinding wheels determine for himself if there is improved performance in the products offered and recommended by the wheel maker's representative, the abrasive industry, as early as 1908, introduced a unique marketing practice. This is the practice of selling grinding wheels on a "test" or "trial" basis.

Briefly stated, the procedure for wheel testing is as follows: a user of grinding wheels orders a wheel (or wheels) to be tried on a specific job to see if the new specification is more effective than the one he has been using. He may initiate the test or he may order the wheels to give a grinding wheel sales representative a chance to prove his contention that the new wheel is better suited for the work being done.

WHY TEST WHEELS

The customer pays for the test wheel in most cases. However, he may pay less for the wheel than if he purchased it as a regular order. He may pay less because the price is based on the quantity discount he would receive for the quantity he would expect to order if the test is successful or he may return the unused portion of the wheel for credit, paying only for the used portion of the wheel if the test is not successful.

A user of grinding wheels will conduct a test of a new wheel specification for several reasons. These are:

1. To select the proper wheel for a new application
2. To select a better wheel for an existing application as a means of cutting his costs
3. To try a new type of wheel which he can reasonably expect to perform better than former wheels
4. To select a second approved source of supply for wheels which are approximately equal to wheels already being satisfactorily used.

Over the years that the testing procedure has been used, certain standards of ethics have developed which are accepted by all reputable grinding wheel makers and users of wheels. A user agrees to conduct the test so as to give the wheels a fair chance to prove themselves within the capabilities and limitations of his plant. He should not enter into a test with a supplier from whom he does not intend to buy wheels if the test proved successful.

The supplier agrees to provide test wheels which are representative of the regular production run of wheels.

The user agrees to report test results in as much detail as possible to the supplier.

Conditions for Testing

Once the decision to conduct a grinding wheel test has been made, the conditions for testing should be established. These may be quite elaborate in the case of a large scale testing program where mass production of identical parts is being done. The other extreme is a simple comparison by the operator in a small grinding job.

The objective of both the user and the supplier of the wheels for the test should be the fair and unbiased report of actual facts on wheel performance. It is important that some standard for comparison be established. If accurate records have been maintained for the wheel presently in use, the same data can be used in checking against the performance of the wheel being tested. If accurate records have not been kept, then a sample of the present lot of wheels should be included in the test.

In the event that the job is a new operation, then at least two different specifications as recommanded by the wheel supplier should be tested to arrive at an optimum specification.

HOW TO TEST

Next a test machine should be selected. Preferably, the same operator should make all evaluations in a particular test and the work pieces should be all of the same general type and material.

It is important to eliminate as many variables as possible from every test. The human variable is quite significant. Every effort should be made to keep conditions as close as possible to being identical for each wheel tested.

Coolant, if used, should be clean and a constant ratio of mix (water to soluble oil) should be maintained. Equipment should be available to measure the material removed. In rough grinding, this may be merely an accurate set of scales for weighing the work before and after grinding. In precision grinding machine operations, it will probably be more practical to measure the metal removed with a measuring device such as a micrometer.

In precision grinding operations where finish is important, an instrument for measuring surface finish should be used in making the test comparison. In this type of grinding, too, proper dressing tools should be used to insure that all wheels used in the test are trued and sharp before beginning the test. A stopwatch may be needed to measure the wheel contact time.

Amount of wheel wear should be measured, too. A scale to measure the diameter usually is sufficient. A somewhat more precise measurement using simple equipment is obtained by measuring the circumference with a tape measure. The change in the circumference will be about three times as great as the change in diameter. The amount of abrasive used can be easily calculated from the measurements.

Other factors to consider in testing various types of wheels are: power consumed, size or type of burr, edge sharpness and tendency to burn.

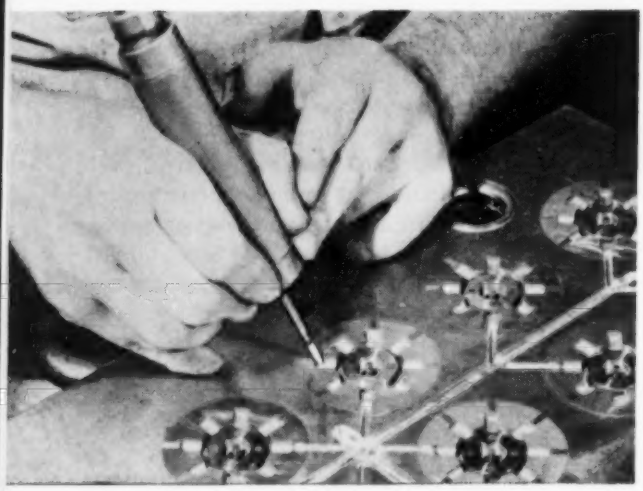
Precision Grinding

Certain testing requirements are common to all precision grinding wheel operations. In cylindrical,

CHECK LIST OF IMPORTANT POINTS BY OPERATIONS

	Mounted Wheels	Portable Grinding	Carbide, offhand	Centerless	Snagging	Floor stand	Cutting-Off	I.D. Precision	O.D. Precision	Surface Grinding	Tool & Cutter
Standard wheel for comparison	■	■	■	■	■	■	■	■	■	■	■
Test Machine	■	■	■	■	■	■	■	■	■	■	■
Test Operator	■	■	■	■	■	■	■	■	■	■	■
Work pieces for test	■	■	■	■	■	■	■	■	■	■	■
Coolant			■	■			■	■	■	■	
Measure Finish	◢		◢	■				■	■	■	■
Truing Device or diamond				■				■	■	■	■
Measure Contact Time	■	■	■	■	■	■	■	■	■	■	■
Measure Wheel Wear	■	■	■	■	■	■	■	■	■	■	■
Measure Material Removed	■	■	■	■	■	■	■	■	■	■	■
Measure Grinding Pressure		■	■		■						
Measure Power Consumed				■	■		■			■	
Measure Burr							■				
Measure Burn							■				
Edge Sharpness			■								■
Report Results	■	■	■	■	■	■	■	■	■	■	■

Solid squares represent points of importance, partial squares represent secondary importance and blanks represent no importance.



internal, centerless and surface grinding, a precision machine is involved. To get the best results from any wheel, particularly when testing the performance of the wheel, the machine must always be in first class operating condition.

Coolant is used in most precision grinding operations. For test purposes, as well as regular grinding, a copious supply of coolant should be directed to the contact area between the wheel and the workpiece. Because coolant volume and mixture affect grinding, often to a marked degree, it is important that coolant conditions remain constant during a test to eliminate errors in observations.

In precision grinding tests, the choice of the best wheel for the job may be based on several criteria. In grinding a difficult material for a small but expensive part, the ability of the wheel to grind at all may be sufficient to prove its worth. If high production is important, the wheel that grinds the most pieces before it is worn out, other factors being equal, will prove to be the wheel to select. Surface finish, at the expense of wheel wear may be a compromise the user is willing to make.

Generally speaking, in precision grinding operations, the quality of the work produced is of greater concern to the user than the cost of the abrasive used. The wheel cost becomes a very small part of the cost of the entire operation when compared to the fixed cost of owning the machine and the operator costs.

Above and below show mounted wheel applications which are performed on a wide variety of work. The operator controls many of the variables and hence operator preference may be a significant factor in testing this type of wheel. (Photos courtesy of the Norton Company)

Rough Grinding

Abrasive cost does become significant in testing results when rough grinding such as billet snagging and casting cleaning is the operation under study. Here the quality of the surface left by the wheel is generally of minor concern. The amount of metal removed is of prime importance. The power consumed is a significant cost item. The machines used are relatively inexpensive and machine cost is usually a minor consideration in the total cost picture. Direct labor cost is an important consideration.

Cutting Off

In testing wheels for cutting-off operations, the prime considerations for selecting the right wheel are the number of pieces which can be cut per wheel, the tendency of the wheel to burn the work and the size and type of burr left by the wheel.

Tool Grinding

In sharpening cutters and tools, the quality of the cutting edge may be the determining factor in selecting the proper grinding wheel. The number of cutters ground per wheel is also significant. Labor cost is another factor to consider, other things being equal. Machine cost will probably not be significant.

Portable Grinding

Wheels for portable grinding machines and mounted wheels are used for such a wide variety of applications, it is difficult to generalize on testing procedures. Operator preference will be an important consideration since he controls most of the variables in the use of these wheels.

If the wheel test is to be conducted properly, someone in the user's plant should be designated to be in charge of the test. The test wheel should be shipped to his personal attention. It may be shipped to the wheel maker's abrasive engineer who will personally deliver it to this man.

The man in charge of the test should know all the details of the test . . . what the job is, what the past experience (if any) has been on this operation, and the results desired. The plant's abrasive specialist is the most logical man to supervise the test.

If the testing is to be extensive, the abrasive supplier may wish to assign a field engineer to work with the user in conducting tests. This is particularly true when the test involves a new product or a completely new application.

Wheel testing, when properly conducted, can be very helpful to the user of grinding wheels. It is a chance for him to be sure that he is using the proper wheel for the job. Recommendations for tests will be made by experienced abrasive engineers representing reputable suppliers only when it is felt that there is a reasonable opportunity to show savings or improvements in the grinding operation for the user. • • •

How Honing Improves Gear Quality

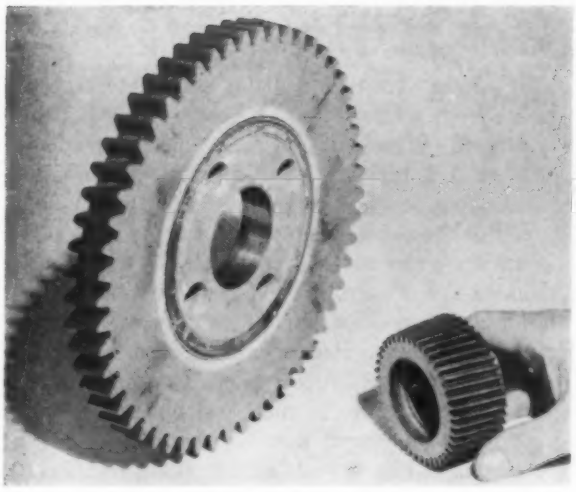


Fig. 1—Typical abrasive-impregnated plastic tools used for honing gear teeth.

Special to GRINDING and FINISHING

● Markedly improved sound characteristics of gearmotor reduction gears, with projected increase in longevity, has been achieved through the honing of gear teeth after hardening. The process of honing for hard-gear finishing is being applied exclusively in the gearmotor field by U.S. Electrical Motors Inc., Los Angeles and Milford, Conn.

The process has been accepted for gearmotor use after thorough engineering evaluation and observation of two years of performance in the manufacture of precision gears in another field, that of high speed automotive transmission.

Lowering of sound level and improvement of working surface quality as well as gearlife is achieved by removing nicks and burrs from the tooth surfaces, correcting minute tooth profile errors, and effecting a finish that is likened to a "ground finish" throughout the contact surfaces.

The honing process is preceded by shaving of the gears before hardening. U.S. uses 4142 steel A.I.S.I. blanks, which are first hobbed and shaved, then heat-treated by the austempering method to 45-50 Rockwell C scale (this austempering method is an elevated temperature quench procedure).

All the teeth are then honed on both the gear and pinions for all high speed gear sets. The Red Ring gear tooth honing process used by U.S. Motors makes use of a unique abrasive-impregnated honing tool (Fig. 1) made of abrasive material held together by a plastic bond and shaped to complement the desired form of the helical gear. Thus, the tool itself resembles a gear. The grit of the honing tool is around 100-125 and consists of aluminum oxide. After hardening, each reduction gear is placed on the special machines (Fig. 2) on which the honing tools are mounted. The honing tool is run in mesh with the hardened gear in crossed-axes relationship, and the latter

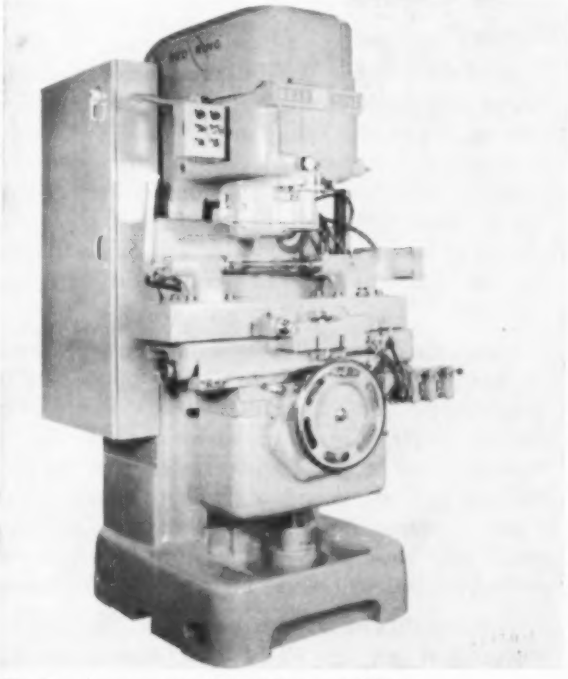


Fig 2—A gear tooth honing machine.

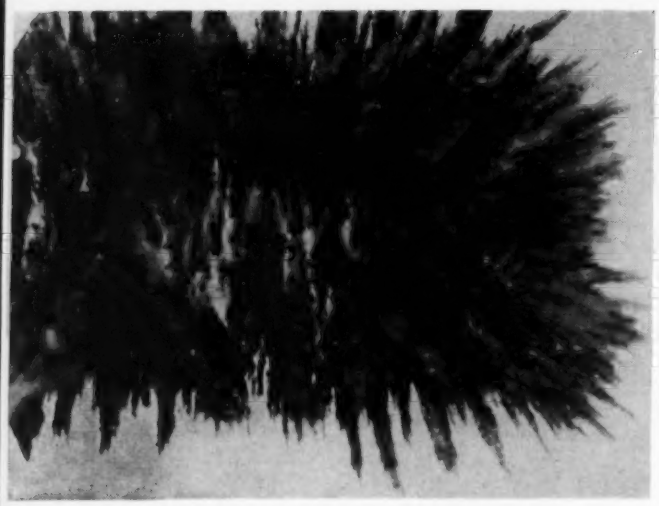


Fig. 3—Honed gear particles on a magnet.

Fig. 4—A nicked gear tooth before honing (enlarged).

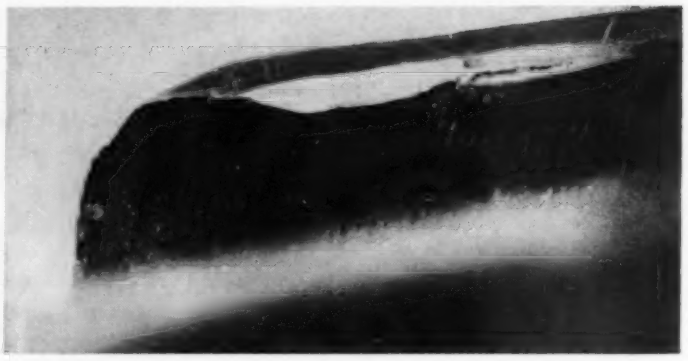


Fig. 5—A nicked gear tooth after honing (enlarged). Note how the raised nick in Fig. 4 has been completely removed.

is driven in both directions at extremely high surface speeds while the work gear is traversed back and forth across the tool face. The cross speed is .008" to .012" for each revolution of the work. Cutting speeds are 500' to 800' per minute peripheral speed at the pitch diameters.

An air-powered tilting table on the machine enables the maintaining of proper forces between honing tool and work gear to assure consistency of gear quality. Honing removes a very small amount of material (shown on magnet, Fig. 3). Yet the differences in nick and burr characteristics of the hardened gear are considerable ("before" photo, Fig. 4, and "after" photo, Fig. 5). It is important to note that this hard-gear honing operation includes the crowning of the gears for elliptoidal tooth form, which prevents sharp tooth corners from clashing and causing "end failure" chips or cracks. • • •

Norton Celebrates 75th

● Editors' Day, which started the two weeks of activities to celebrate Norton's 75th Anniversary, began with a summary of Norton's past and a prediction of the future by Milton P. Higgins, President.

Mr. Higgins gave the five most significant developments in Norton's history as; the manufacture of Alundum (aluminum oxide) in electric furnaces; development of the cylindrical grinding machine by Charles H. Norton; Norton's combining with Behr-Manning; building of foreign plants which now number 15; and since the war the development of high temperature specialty products.

About the future Higgins said, "We will remain in our own field." There is enough room for development and expansion in this industry without diversifying in other businesses. He felt the foreign markets will develop faster than the U. S. because of lower standards which allow for more room to expand. Although their foreign plants could ship back to the U. S. at 10-20% less than costs here this will never be attempted by Norton.

Three points high lighted the day. The first was the tour of the new Plant 8 for organic grinding wheels. This operation comes as close to the phrase "untouched by human hands" as any plant we have visited recently. From the receiving of raw materials to the finish material, automatic handling moves the products along well planned flow lines.

After this tour an announcement was made by Wallace L. Howe, Vice President and Director of Research and Development, which introduced the new aluminum oxide abrasive called "75" Alundum and the synthesizing of diamonds.

The third event was the tour of the new Central Service Building. The building is, in effect, a self contained factory capable of supporting a manufacturing business employing about 500 people. The products of this "factory" are specially designed and built production machinery and maintenance service to the entire plant. Also included in the building is the central commissary which is headquarters for the six cafeterias throughout the plant. There is a cafeteria with a seating capacity of 600 people. • • •

NIAGARA CUTTER DIV.
N. TONAWANDA, N.Y.

DIAMOND WHEEL RECORD

DIAMOND WHEEL SERIAL NO. 78 — COST PER (001) ONE-THOUSAND $.97

DIA.	JOB NO.	OPERATOR	USED
6.003	—	INITIAL READING	—
6.00	1487	Jones	.003
5.996	1438	Smith	.004
5.990	1497	Dull	.006
5.988	1490	Aiken	.002
5.985	1498	Jones	.003
5.982	1503	Dull	.003
	etc.		
5.748		WHEEL EXPENDED	

FIGURE 1

Using a wheel dresser for diamond wheels and by careful record control a tool manufacturer has been able to greatly reduce the diamond wheel costs.

Interview with
MARSHALL DAMERELL, vice president,
Niagara Cutter Div.
Bollier-Damerell, Inc.

Motorize Wheel Dressing...and Records Cut Diamond Wheel Costs

● To paraphrase an old axion and bring it up to date under today's conditions, "a dollar saved is five dollars earned". This was brought to light in our own shop and it can be multiplied by thousands of dollars in thousands of shops, large and small, throughout the industry.

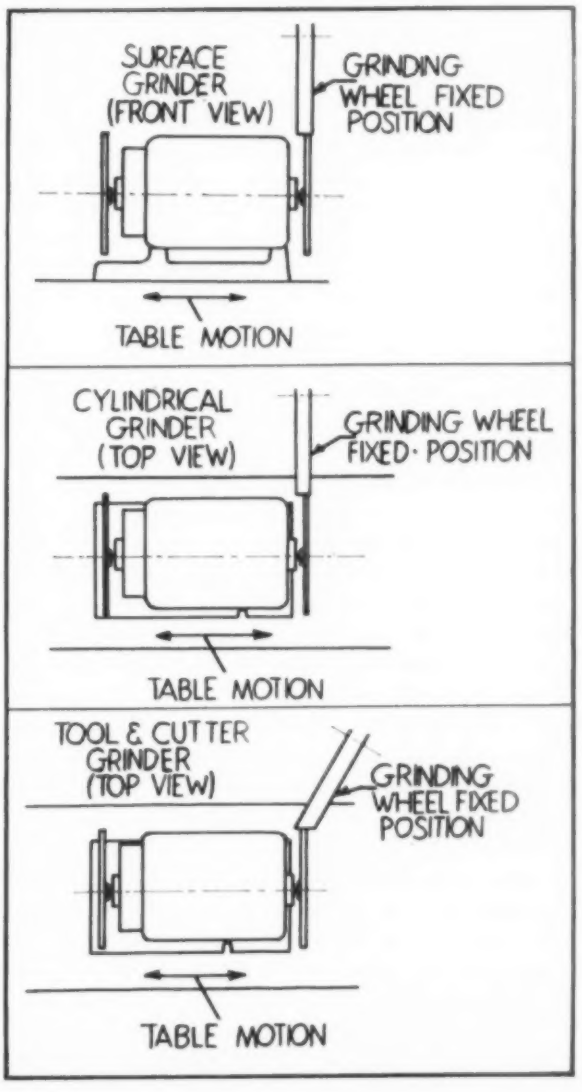
The high cost of expensive and, unfortunately, expendable diamond wheels was shown up in our custom tool making plant, thanks to the record keeping system which we developed and installed for our own use.

Through our years of experience in designing, manufacturing and servicing carbide cutting tools on a territorial and national basis, we sensed that our replacement cost of diamond wheels was getting out of line.

A careful check of our plant traffic from tool crib to machines, and back to tool stock, revealed no losses due to losing or misplacement of the diamond wheels. Our records developed the fact that the actual working life was extremely short, based on work turned out and dated life of each wheel.

A study of each job operation was instigated and it developed that in order to maintain and deliver tools of our manufacture or repair, our operators had been faced with the problem of "do it yourself" methods of dressing the diamond wheels.

It had been necessary to correct "loading-up", chipping, odd angle chamfers and out-of-round conditions as best they could, without regard to control of amount of diamond stock removed from the wheels.



In view of the high cost of, and number of diamond wheels which we were using, and replacing, our chief tool designer worked on the premise that a diamond wheel should be dressed by methods as accurate as the work the diamond wheel was originally intended to do.

Naturally, the wheels were subject to normal wear and the problem was to renew the cutting surface and cutting angles with minimum removal of the expensive diamond wheel. In general, our records showed that removal of .001" of diamond from a wheel cost $1.00. This immediately brought to light the fact that excess removal of stock during dressing operations was running up our replacement costs.

In order to correct this situation, we realized that a wheel should be dressed as carefully as it was used. In other words, when manufacturing and reconditioning carbide tools, the wheel is not forced to hog-off the metal and conversely, the dressing operation should not hog-off the diamond surface.

As a result, a small motor driven diamond wheel dresser was developed for mounting on the chuck of surface grinders and the table of cutter grinders which would make possible the conditioning of the diamond wheels and do it under the close control of the grinder feed.

This made it possible to dress the diamond wheel with a "kiss" touch under micrometer control, without relying on the diamond wheel to supply the driving force to the dressing unit. The motor driven dressing unit makes it possible to have the dressing wheel rotate parallel or at an angle to the rotation of the diamond wheel while the dressing operation is being performed. The dressing unit is mounted on a specially designed slotted base which can be held by clamp or magnet to the grinder table.

As a result of the successful operation in our own plant, it became evident that this dressing unit had wide applications throughout the manufacturers and users of carbide tools and therefore, the unit is being offered nationally on a low cost volume production basis.

However, systematic wheel dressing was not the whole answer. We also wanted to know how much of our diamond wheels were used on each job, and also whether some jobs were real "diamond hogs" requiring careful study and cost control. The following system was developed:

A card system is used, with one card for each size and type of wheel that we normally stock and use. On these cards are listed the purchase order number, date of order, date wheel was received, manufacturer's name, complete description of the wheel and price paid.

The next phase is the Shop Record Book. After a wheel is received, visually inspected and recorded in the card system, the wheel is given a serial number. All wheels are numbered consecutively by date of receipt. This number is painted on each wheel in four places and generally remains legible throughout the life of the wheel. The wheel is assigned a page in the book corresponding to the serial number (figure 1) and the wheel is measured for the initial reading. The cost per .001 diamond is also written at the top of the page. After the wheel is used, it is again measured and the new size, job number and operator's name is recorded in the Shop Record Book. This is done each time the wheel is used and the measurements account for all of the wheel life.

The final phase is a ticket (figure 2) with job number, operator's name, wheel number, record man's initials, cost per .001" and amount of diamond expended on that specific job. If the wheel is removed from the machine, a tag is tied to it and it cannot be put on another job until the tag is filled out and removed. This ticket is filed with time records in the office and used when the job is billed.

This procedure is carried on until the wheel is

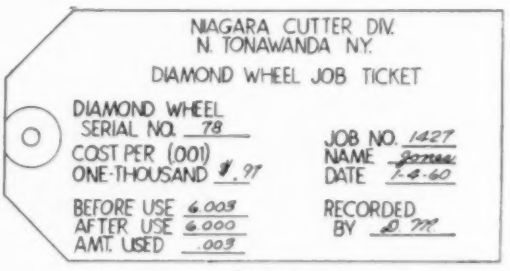


FIGURE 2

expended. The final "stub" is subtracted from the initial diameter as a check on the wheel manufacturer, and the page in the record book is closed out. Stubs are returned to the office where a requisition for a new wheel is started.

We feel that this system gives us exact information on diamond wheel performance and costs. The procedure is also used as a basis of assigning personnel. We have found that some operators can grind a lot more carbide than others with the same amount of diamond expenditure. We also find jobs that use more diamond than they should and we look into these and try to improve methods. We also have definite performance records for comparison of wheels from various manufacturers. The system practically eliminates theft because wheels unaccounted for are missed immediately and the stubs have to be returned to the office. If wheels are broken or damaged, it is known immediately and steps are taken to eliminate the hazards.

Many shop people look at diamond wheel wear, usage and cost as a great mystery and make no attempt to figure out why wheels just "disappear." Like anything else, if studies are made, controls set up and intelligent analysis made of the data, tremendous savings can be effected.

The record system is only the information side of the ledger. The action side is up to the operators, foremen and superintendents to develop procedures and techniques to reduce these costs. The record system tells you when you are making progress. • • •

Grinding and Finishing

JUNE, 1960

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EDITORIAL

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Completely automatic cycle, with automatic positive size control. High-speed approach, variable feed, spark-out and withdrawal are positively controlled through simple cam action. Wheel slide is held against a positive stop with uniform hydraulic pressure.

All kinds of wheel trueing, including PFC through 12" width. All types of J & L diamond dressers are available. Also, crush dressing for wheels up to 4" in width. In cemented diamond particle cutters for continuous wheel forming, there are sensational new capacities up to 12" wide.

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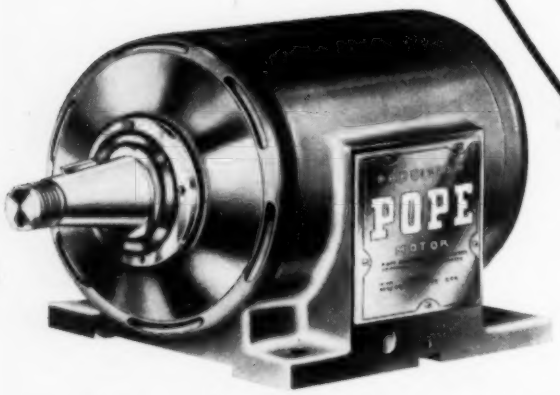

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1 to 20 H.P.—900 to 3600 R.P.M.—with straight or tapered shafts

Here is a Precision Driving Motor that has the rigidity and dynamic balance you've always wanted!

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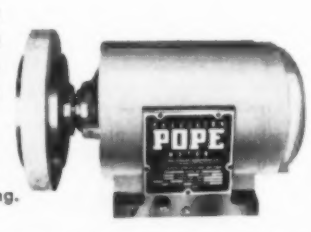
A pair of extra large precision angular contact preloaded bearings in the rear housing are mounted close to the rotor for extra rigid support of the motor under working loads.

You can make fast convenient wiring connections from the large junction box furnished on whichever side of the motor you specify.

Ask for data sheet SK-306 for outline dimensions and specifications.

Let us quote you on these Precision Driving Motors for use on all your equipment where a real Precision Motor is required.



One of the new Pope Precision Motors equipped with a Pope balancing type wheel holder for precision grinding.

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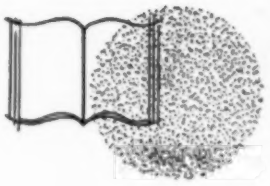
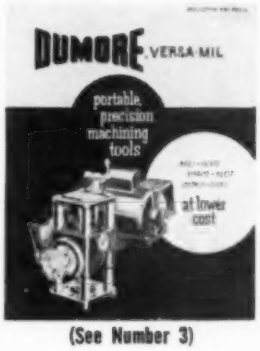


Literature

1. Diamond Data. A new monthly technical publication is available on request. The second issue, Vol. 1, No. 2, features an article on grinding costs. While diamond wheels are used in this instance, the techniques are said to be equally applicable to silicon carbide and aluminum oxide wheels. Technical Information Department, Engelhard Hanovia, Inc., 75 Austin Street, Newark 2, New Jersey.

2. Honing Stone Selection Kit. Bulletin X-SP-5076 is a two-page, two-color flier describing the new Sunnen honing stone selection kit. Contains complete information as to stones included, gives tips to aid in selection of proper stones. The cabinet contains 224 stones most commonly used in machine shops and tool rooms. Sunnen Products Company, 7910 Manchester St., St. Louis 17, Missouri.

3. Portable Grinding Equipment. Bulletin VM-60-C tells about three sizes of Dumore Versa-Mil® equipment for grinding, shaping, milling, boring, and related machining operations on small, medium, or large work. Includes design features, accessories, and sample applications. Six pages, two doors. The Dumore Company, 1300 Seventeenth Street, Racine, Wisconsin.



(See Number 3)

(See Number 4)

(See Number 5)

4. Wet Blast Surface Finishing. Eight-page brochure describes typical applications, equipment, and case histories of benefits from using Liquid Honing® Vapor Blast Mfg. Co., 3205 W. Atkinson Avenue, Milwaukee 16, Wisconsin.

5. Diamond Wheels. New diamond wheel catalog from American Coldset contains six pages of useful information as well as the conventional shape, size, concentration and price information. Shape types are pictured and indexed in the table of contents. The identification code is explained fully. Two pages of tips on the care and application of diamond wheels, in easy-to-follow outline form, add to the value of this brochure. American Coldset Corporation, U. S. Route 46, Teterboro, New Jersey.

6. Standard Shapes and Sizes of Grinding Wheels. This 76-page booklet, subtitled "Simplified Practice Recommendation R45-57." is the basic reference for grinding wheel shapes and sizes. One of the basic references for grinding wheel users, this deserves a place in the desk of every abrasive engineer and grinding foreman. Grinding Wheel Institute, 2130 Keith Building, Cleveland 15, Ohio.

7. Optical Comparator. Six-page gate fold brochure in two colors covers Jones & Lamson's new TC-10 optical comparator and measuring machine, which can be used in either vertical or horizontal position. The new unit is spotlighted as one with big machine versatility at low cost. A number of close-ups illustrate various features of the machine, and full specifications are given. Jones & Lamson Machine Company, Optical Comparator Division, Springfield, Vermont.

8. Abrasive Belt Machines. Five models of abrasive belt grinders for centerless applications are featured in the latest catalog of Production Machine Company. These and other abrasive belt machines of the company are briefly described and illustrated, and reference is made to individual bulletins giving complete details and specifications. Ask for "The Production Story." Production Machine Company, Greenfield, Massachusetts.

9. Coolant Filter. New bulletin DP 114 is a technical discussion of the applications and operation of the CFC Delpark® Filter-Matic, which is described as automatic, self-cleaning, and available with a variety of durable media. It is said to be particularly applicable where heavy contamination in liquid-solid separation presents problems. Commercial Filters Corporation, 2 Main Street, Melrose 76, Mass.

10. Air Filtration, Dust Control. A new external newspaper designed for those interested in air filtration, dust control, and heating, ventilating, and air conditioning has been started by the American Air Filter Company, Inc. Published bimonthly, it will provide product information and technical articles, together with regional news from each of four areas—southern, eastern, pacific, and midwest-central. American Air Filter Company, Inc., "American Air Facts," 215 Central Avenue, Louisville 8, Kentucky.

11. Man-Made Industrial Diamonds. The successful development of man-made diamonds for metal-bonded diamond wheels is the occasion for an attractive twelve-page brochure recounting the story of the efforts to duplicate natural diamonds, culminating in GE's successful projects of a few years back. Case reports of successful applications are included. Metallurgical Products Department, General Electric, 11177 East 8 Mile Road, Detroit 32, Michigan.

(See Number 7)

To obtain literature use Reader Service cards on page 51. Circle on the card the number which appears at the start of the paragraph describing the literature you request.

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Earl Poinar, Owner
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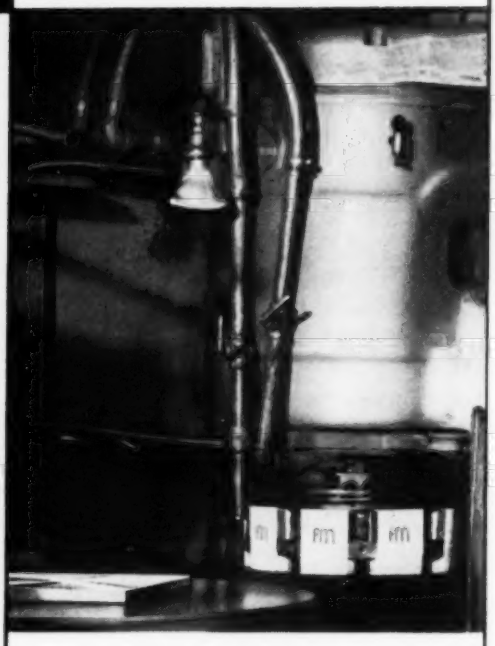
Akron, Ohio



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"My business is contract surface-grinding . . . a tough, highly competitive business . . . and a field where success or failure often depends on the quality of the segments used. That's why we now use only FM segments in our shop.

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70 WATER STREET • WEST HAVEN, CONNECTICUT

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FREE LITERATURE *continued*

12. Wheel Dressers, Work Holders. A dozen items from the J & S line are described in this four-page, two-color folder. Each is illustrated, and the brief text points out the major features of the item. J & S Tool Co., Inc., 87 Dorsa Ave., Livingston, New Jersey.

13. Electrostatic Chucking System. What is claimed to be the first and only electric chuck for such non-magnetic metals as stainless steel, aluminum, brass, bronze, zinc, etc., is described in a six page two-color folder. The unit can be supplied in two sizes—one with a 5" x 8" working surface, the other with 6" x 18". An inclinable adaptor which permits the chuck to be tilted up to 15° on its longitudinal axis can also be supplied. Electroforce, Incorporated, Fairfield, Conn.

(See Number 12)

14. Rotary Diamond Dressing Wheel. Three outstanding applications are featured in this new bulletin on the Tru-Grit® formed rotary dressing tool. Formed in powdered metal to the configuration required in the finished part, the tool is claimed to accomplish much of its savings without interrupting the grinding cycle. A number of illustrations are included, and other services and products of the company are listed. Wheel Trueing Tool Company, 3200 W. Davison Ave., Detroit 38, Michigan.

15. Cutting Fluid. TRIM, a product of Master Chemical Corporation, is described in this four-page folder as a "chemical machining tool" that actually helps make the cut. Six different types of the coolant are listed, and advantages are briefly told and illustrated by cartoons. Master Chemical Corporation, 13 N. Huron St., Toledo 1, Ohio.

16. Grinding Wheel Treatment. New four-page folder in two colors contains added evidence concerning wheels treated with Dri-Kool®, a synthetic colloidal graphite with particle size ranging between 1/125 and 1/100 micron. Directions for soaking wheels in the material, as well as precautions to be taken, are included. King Graphite Products, Inc., 21949 South Telegraph Road, Trenton, Michigan.

17. The Sheffielder. This year's second issue of this publication on gaging features a story of the measurement of a four-inch gage block, on which the standards laboratories of England, Germany, and the United States agreed with Sheffield's Eli Whitney Metrology Laboratory to within a fraction of a millionth of an inch. Three of the four agreed to within a "tenth"—of a millionth, that is. The Sheffield Corporation, Dayton 1, Ohio.

18. Portable Electric Tools. Gatefold flier describes sixteen new Stanley portable electric grinders and drills, announces a special guarantee running to June 30, 1961. Each tool is pictured and described, with complete information as to its rpm, spindle size, voltage, over-all length, net weight, and price. Stanley Electric Tools, Division of The Stanley Works, Myrtle Street, New Britain, Connecticut.

19. Dust Control. A new American Air Filter reverse jet fabric dust collector, Model B, is discussed and analyzed in this eight-page, two-color pamphlet. The operating principles are explained and the unit is illustrated by a number of cutaway sketches. The bulletin also contains

(See Number 20)

tabulations of application data and size data, a selection nomograph, and complete dimensions on all units. American Air Filter Company, Inc., Louisville, Ky.

20. Collet Chuck. A four-page folder punched for standard three-ring binders describes a new Jacobs Model 50 collet chuck, and the 500 Series of Rubber-Flex® collets. The ten collets in a set are said to cover a greater range than 63 standard steel collets. The chuck is priced at $70.00 and the set of collets at $65.00. Catalog 60-XC. The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

"That hog-caller beats any machine we've ever tried."

The Beginning of a Revolution!

Look for "G"—the identifying prefix of a J.K.S. Man-Made Diamond Grinding Wheel.

G D100 R100 BE 1/8
J. K. SMIT & SONS

J.K.S. Diamond Wheel Developments
Slash Grinding Costs—Speed Production

Now, one of the world's most experienced manufacturers of diamond grinding wheels has brought its technical knowledge to the production of man-made diamond wheels.

The result is a revolutionary advance. Today's new J.K.S. man-made diamond wheels give longer life in many applications . . . speed up production on many difficult grinding jobs. Yet there is no extra cost . . . they are now priced the same as wheels made with natural diamonds.

In these wheels, too, you get a famous J.K.S. plus value: exact uniformity in wheel construction . . . duplicated in wheel after wheel . . . an advantage that results from special J.K.S. techniques and quality control.

NEW DIAMOND WHEEL CATALOG NO. 65

A necessary reference publication for everyone who buys or uses diamond grinding wheels . . . send today for Catalog, "J.K.S. Diamond Wheels, Saws and Hones."

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FREE LITERATURE *continued*

21. Production Chilling Equipment. Large capacity production chilling equipment for stabilization of metals, stress relief of castings, dehydration of gases, expansion assembly, and many other similar problems are described and illustrated in a new bulletin offered by Cincinnati Sub Zero Products. Three standard models are available with temperature ranges to -150°F, and thermal capacities from 500 to 10,000 BTU/hr. Cincinnati Sub Zero Products, 3930 Reading Road, Cincinnati 29, Ohio.

22. This Is SND. A new booklet of interest to users of diamond wheels is "This Is SND," a 20-page detailed description of the recently-introduced selected natural diamond grit, its advantages and best areas of application. The booklet contains tabular information relating particle shape, size and efficiency to bond material, wheel speed and infeed in the grinding of cemented carbides, glass, stone, and other materials. Technical Information Department, Engelhard Hanovia, Inc., 75 Austin Street, Newark 2, N.J.

23. Abrasive Blasting Equipment. Illustrated bulletin HPB 60-1 describes new wet and dry abrasive blasting equipment available from Hydra-Blast and Power-Blast Manufacturing Divisions, Automation Services, Inc., P.O. Box 5554, Fenkell Station, Detroit 38, Michigan.

24. Pressure-Type Abrasive Blast Cleaning. What is claimed to be a guide to sandblasting as well as a catalog of machines and accessories has just been released by the Sanstorm Manufacturing Company. This catalog No. 594 contains information on both open-top and closed-top pressure type sandblast machines; data tables on ratios of nozzle bore sizes to compressor capacity; and operator accessories. Sanstorm Manufacturing Co., P. O. Box 1173, Fresno, California. (Company letterhead, please.)

(See Number 24)

25. Work Holders. Insta-Clamps, the new universal hold-down clamp, will secure various sized work pieces to machine tool tables without requiring heel blocks or shims. Complete catalog specifications and prices in a one-page flier. Insta-Clamp Company, 2420 Home Place, Dearborn 8, Michigan.

26. Diamond Wheels. A new and comprehensive catalog (M1501) describing the complete line of Manhattan diamond wheels is now available. Included are detailed data on available grit sizes and diamond concentrations, wheel markings, suggestions to prolong wheel life, and complete ordering information on both resinoid bonded and new metal bonded wheels. A complete net price supplement is enclosed, for prices effective March 1, 1960. Abrasive Wheel Department, Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N.J.

27. Die Making Machines. Three models of die-making machines are described and illustrated in two catalog sheets designated as Bulletins DF 1-22 and DF 1-26.

NEW STASET CATALOG LISTS 232 STANDARD DIAMOND TOOLS

Plus FULLY ILLUSTRATED INFORMATION SECTIONS COVERING

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- radius dressing tools
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- Staset "rib-nib" mounting
- wheel type tools
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This illustrated 36-page data source provides you with complete specifications and pricing of over 300 different Staset diamond tools . . . no other diamond tool catalog gives you as much comprehensive information as Staset's new Catalog #460! Whether your requirements for diamond tools are large or small, you'll find this handy *one-book* reference a valuable time saver.

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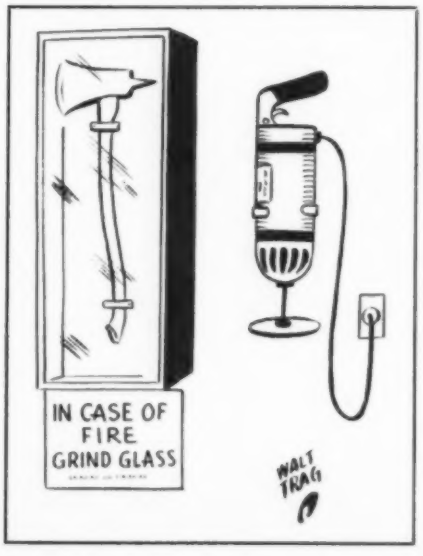

These are described as a complete line of machines for die filing, sawing, and lapping. Bench and floor models are available, with two speeds, four speeds, or infinitely variable from 100 to 475 strokes per minute. Rice Pump & Machine Company, Belgium, Wisconsin.

28. Hydraulic Feed Surface Grinders. Two new Grand Rapids surface grinders, No. 206 and No. 208, are described in this six-page gatefold pamphlet. Various construction features are described and illustrated in close-up sketches. Complete specifications are listed for each machine. Bulletin GL-2-60. Gallmeyer & Livingston Co., 400 Straight Ave., S. W., Grand Rapids 2, Michigan.

(See Number 28)

29. Ordering Grinding Wheels. "How to Order 'American' Grinding Wheels" is a new bulletin detailing standard markings for grinding wheels, shapes, abrasive characteristics, grinding wheel recommendations for specific jobs, and a wheel speed conversion table. Intended as an aid to buyers, this new brochure outlines nomenclature, meaning of wheel markings, and the information required by a manufacturer for adequate customer service. Contains over 140 grinding wheel usage recommendations broken down by material and job classifications. American Emery Wheel Works, 1 Richmond Square, Providence, R.I.

100. Sam Safety Posters. A single copy of the current Sam Safety poster, or of any one of the eight which have preceded it, 8½" x 11", on 100# enamel, is available on request. Circle No. 100 on the Reader's Service Card. Nos. 1-7 (September, 1959-March, 1960) are available immediately; Nos. 8, 9, and 10, (April, May and June, 1960) will be available about June 15.

For larger quantities, circle No. 100 on the Reader's Service Card, note on the bottom of the card the numbers and the months of publication of the posters you want, and enclose the card with a remittance according to the following schedule:

Up to 9 posters ..... .15 each
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but TORIT Dust Collectors protect your workmen and build good morale

Clean working areas make healthier, happier, *more productive* workmen. Torit Dust Collectors trap dust before it irritates workers. Unitized Torit Dust Collectors are completely portable—cost a fraction of central built-in units and are not limited to particular areas. In addition, Torit Collectors save heat by recirculating clean filtered air.

Free descriptive handbook describes all models and applications. Write today to . . .

TORIT MFG. CO. Department 508 1133 Rankin St. Saint Paul 16, Minnesota

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Watch the mail for news about COOLTEX...

GET BRIGHTER, SMOOTHER GRINDING FINISHES

COOLTEX, the *new* chemical grinding coolant, gives you better finishes because it keeps the work *cooler* . . . keeps the wheel from loading. Actually lets you use a *finer* grit! COOLTEX is transparent, so you can *see* the work — and it keeps machines noticeably cleaner. Your Texaco Lubrication Engineer is mailing COOLTEX idea postcards now. Watch for yours. Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

Tune In: Texaco Huntley-Brinkley Report, Mon. Through Fri.-NBC-TV

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Equipment and Materials

Surface Grinder Provides Microinch Finish at Production Speeds

Microinch finish at production speeds is a feature of a fully hydraulic No. 206 feed surface grinder introduced by Gallmeyer & Livingston Company, manufacturer of Grand Rapids grinders.

Built around a solid one-piece column and base, it assures permanent alignment between vertical head ways and cross travel ways, a traditional Grand Rapids feature. Amount of cross feed is controlled from a panel on saddle front and the cross feed itself is variable up to ¼" per table reversal.

This new machine is equipped with a Vickers vane type pump and a Gallmeyer & Livingston-designed control valve—giving an infinite number of longitudinal table speeds up to 110' per minute. Also provided is a variable speed continuous cross feed for dressing or quick positioning. Saddle may be automatically reversed at any predetermined point by adjustable dogs mounted on side of base.

The vertical movement of wheel is made by a large (outer) hand wheel and/or small (inner) one, conveniently located on the head of the grinder. The large hand wheel, used for coarse vertical adjustment and graduated in widely spaced thousandths, moves .060" with one turn, while the small hand wheel, providing a fine vertical adjustment and graduated in tenths of thousandths, moves .012" with a turn.

Severe service demanded by the use of diamond wheels is no problem with this machine since it has a rugged, four-bearing grease-sealed spindle. Spindle requires no lubrication for the life of the bearings.

The new 206 is regularly equipped with an 8" grinding wheel with 13" capacity under the wheel and 14" of vertical movement.

Net weight without accessories is 3300 pounds.

Gallmeyer & Livingston Company, 430 Straight Avenue S.W., Grand Rapids 2, Michigan.

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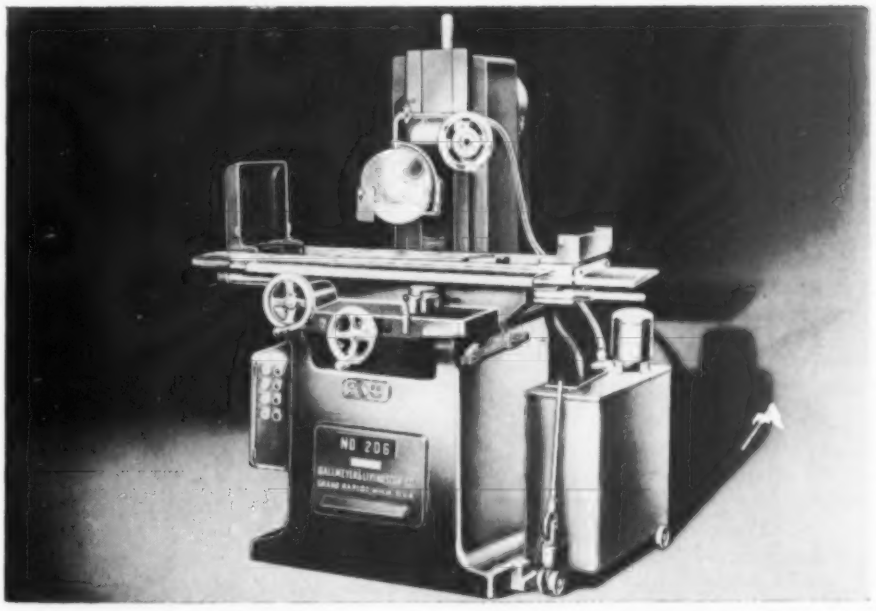
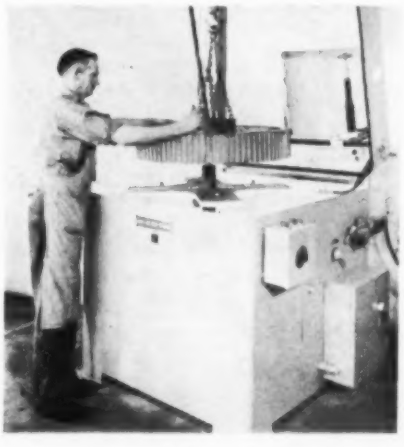


Gear Deburring Machines

To augment its line of gear deburring machines, The Redin Production Machine Company has introduced a new Model 36.

This machine is designed to deburr and chamfer large spur, helical, worm, and bevel gears as well as splines.

Model 36 will handle external gears up to 36" and internal gears to 32" pitch diameter. The work spindle will handle a load of over one ton. The gear illustrated is 34½" diameter, weighs about 1,250 pounds, was deburred in a time cycle of two minutes per side.



The Redin Production Machine Company, 2433 20th Street, Rockford, Ill.

Use postpaid card. Circle No. 32

New Faster-Cutting Grinding Disc

Manhattan Rubber Division of Raybestos-Manhattan, Inc., announces a new depressed center abrasive disc reported to cut and remove metal faster than any similar type wheel. This claim is substantiated by laboratory and supervised field trials in which 28 competitive discs were also tested. The new wheel, known as the Fast-Cut Moldisc, produced the lowest overall grinding cost based on metal removed and wheel life.

Other features claimed for the Fast-Cut Moldisc are: reinforced for maximum safety, uniform cutting action, much longer life and less operator fatigue.

The new wheel is designed for use in fabricating shops for grinding welds and bevelling edges, and in foundries for notching gates and risers and trimming fins.

Fast-Cut Moldiscs are available in 7" and 9" diameter sizes in ⅛", 3/16" and ¼" thicknesses. Abrasive Wheel Department, Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, New Jersey.

Use postpaid card. Circle No. 33

New A10 Abrasive for Stainless Slabs, Billets

A radically new aluminum oxide abrasive, developed especially for stainless steel billet and slab grinding, has been introduced by Norton Company. It will be known as 75 Alundum abrasive, appropriately named because of its introduction during the Company's 75th anniversary year.

According to Robert Cushman, general sales manager of the Company's Abrasive Division, "In extensive laboratory testing and initial field tests, the new 75 Alundum wheels have shown themselves capable of removing twice as much metal per wheel as the best grinding wheels previously used. Fast rate of cut and long wheel life reduced the total cost per pound of metal removed by as much as 40%."

To take fullest advantage of the higher pressures and speeds used in grinding stainless steels, it was necessary to develop a new and tougher abrasive. 75 Alundum abrasive was designed to meet this challenge and is now ready for marketing.

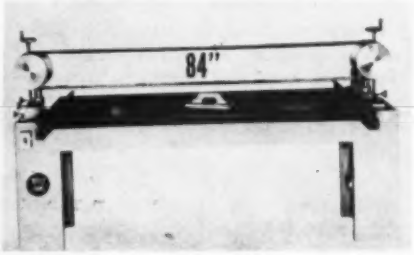
Norton Company, Worcester 6, Mass.

Use postpaid card. Circle No. 34

Large Belt Grinder-Finisher

A new large capacity model hand-stroke belt sander-finisher for finishing wood, ferrous and non-ferrous metals, and plastics has just been added to the power-tool line of the Boice-Crane

The new Boice-Crane, which fills the demands for a larger and faster belt abrasive machine, has a reciprocating work table with more than double the area of its preceding model. The table actually measures 84" x 28". This new model is suitable for finishing some



of the largest steel sheets in the fabricating field. One of the first installations is satin-finishing large stainless steel panels for passenger elevator cars. In the field of metal finishing, research has resulted in abrasives which perform best at speeds of around 4,000 sfm. To provide for such increased speeds, turned, balanced aluminum drums are provided in the new model, an innovation in the moderate price

Boice-Crane Company, 839 Central Avenue, Toledo 6, Orio.

Use postpaid card. Circle No. 35

New Light Band Vernier Obsoletes "Calibrated Eyeball"

Human guesswork is said to be elimiminated and far greater accuracy is attained with the new light band vernier from Acme Scientific Company.

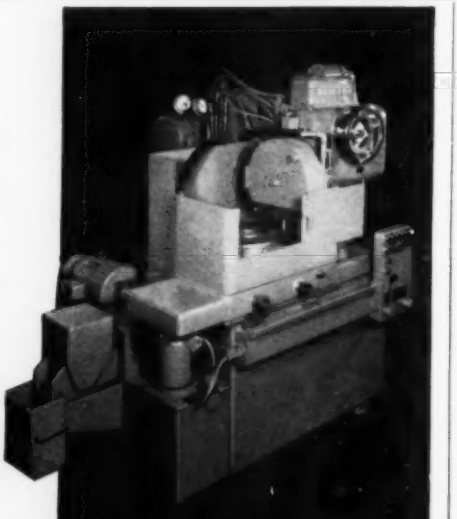
Priced at $39.75, it is designed for use with a monochromatic lamp and an optical flat. The device establishes

an accurate linear value for light band interpretations, requiring only simple arithmetic for conversion to precise equivalent in millionths of an inch.

Acme Scientific Company, 1450 West Randolph Street, Chicago 7, Illinois.

Use postpaid card. Circle No. 36

This Sundstrand-Arter grinder available for toolroom or production grinding...



. . . toolroom type is fed down manually in preset increments, then switched to automatic repeat . . . production type rapid advances to work, then automatically feeds in preset increments. First strokes are rough grinding feed with automatic change to finish. Machine stops and retracts when part is completed.

MODEL E FEATURES

- Rugged column and long ways permit both heavy stock removal and fine finishes.
- Tiltable table for concave or convex grinding.
- Concentric line-grinding pattern.
- Rough and fine wheel feeds permit both operations in same machine.
- Compensation for wheel wear or wheel dressing doesn't disturb feed setup.
- Sundstrand concentric pole magnetic chuck is standard equipment.

Ask for Bulletin A-366.

SUNDSTRAND-ARTER GRINDERS
SUNDSTRAND MACHINE TOOL • Belvidere, Illinois
Division of SUNDSTRAND CORPORATION

SUNDSTRAND ARTER

Use postpaid card. Circle No. 239

Stronger Disc Center Holes Improve Surface Finishes

Better surface finishes possible from Michigan RED COAT resin Fibre discs are said to result from an improved manufacturing process that strengthens disc center holes. Strengthened mounting holes minimize the appearance of "intra-oscillating" effects during the working cycle of the discs. These effects result from rapid center-hole breakdown when discs are forced onto out-of-round grinder spindles. Intra-oscillation causes scratch patterns that require extra working time to blend into desired surface finishes.

Used chiefly in metalworking applications, the improved discs are available in standard industry sizes ranging from 5- to 9⅛-inches in diameter. Center mounting holes are standard ½- and ⅞ inch. The discs are manufactured with aluminum oxide abrasive and a variety of grit sizes ranging from 150 and coarser for heavy duty cutting. Full or spaced coating is optional in 36 grit and coarser depending upon the user's requirements .

Michigan Abrasive Co., 11900 East Eight Mile Road, Detroit 5, Michigan.

Use postpaid card. Circle No. 37

Small Abrasive Discs Packaged Transparently

Clear plastic tubes have replaced chipboard boxes as containers for small abrasive discs made by Behr-Manning Co., a division of Norton Company. The new package is being used for pressure-sensitive adhesive discs up to 2¼ in. in diameter, employed mainly in metal grinding and finishing operations.

The new butyrate holders offer ease of opening and removal; complete protection for unused discs in storage;

and dust-proof, moisture-tight packaging which retards drying of the adhesive coating. Shelf life is extended and immediate inventory made possible.

Discs in diameters from ½ in. to 2¼ in. are packaged in tubes of five sizes. The discs are used mostly on high speed power tools and stationary disc sanders.

Behr-Manning Co., Troy, New York.

Use postpaid card. Circle No. 38

Unique Marking Device

Rotor Tool's Model AR, Airiter is a marking device for practically all materials, a true reciprocating air motor about the size of a fountain pen.

Its weight is 5¼ ounces; length, 5-3/16". With 1 cfm air at 90 psi, it delivers 12,000 blows per minute. It will operate in a range of 40 to 100 psi. No pressure regulator is necessary.

The Rotor Tool Company, 26300 Lakeland Blvd., Cleveland 32, Ohio.

Use postpaid card. Circle No. 39

New Collet Chuck Development

A new development in collet chucks for lathes, by The Jacobs Manufacturing Company, has a handwheel-operated, nose-type closure and "Rubber-Flex" collets. According to the manufacturer, it offers the user complete collet chucking at purchase price savings up to 71%. The chuck and a set of ten collets retails for $135.00.

Claims made by the manufacturer for its new Model 50 collet chuck are: easier, faster collet changing; capacity increases up to 42%; runout of no more than .001" at the nose; a range of .100", twenty times that of conventional collets; bar capacity from .100 to 1.063; more than enough gripping power for heaviest duty cutting on light

One Sundstrand magnetic chuck holds all sizes of parts machined on this grinder . . .

Small, medium, or large parts, the deep penetrating power of a Sundstrand magnetic chuck holds them securely, simplifies set-up, and eliminates clamping time. Get complete information—ask for Bulletin A-366.

Here, the Sundstrand chuck holds a load of 102 gears.
Here, the same chuck holds four slide castings.
Here, a large drill press frame is held securely.
SUNDSTRAND
POWER-GRIP

SUNDSTRAND MAGNETIC PRODUCTS

SUNDSTRAND-AMERICAN BROACH • Ann Arbor, Michigan

Division of SUNDSTRAND CORPORATION

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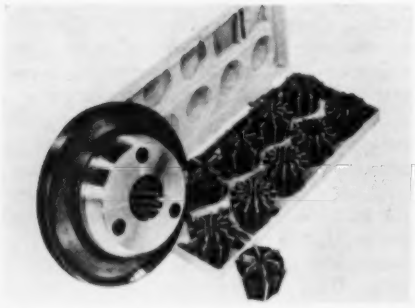


lathes; direct spindle mounting without need for threading adapter.

The Jacobs Manufacturing Company, West Hartford, Connecticut.

Use postpaid card. Circle No. 40

Blast Cleaning, Peening Machine

A new type blast cleaning and peening machine, the Peenamatic® Model 920, is specifically designed to process small and medium-sized parts of a variety of shapes that cannot be handled economically in conventional equipment.

Parts are loaded into the easily removable hex barrel which is then placed in the cabinet. After the lid is closed, the barrel is constantly rotated, exposing all sides of the parts to the blast stream.

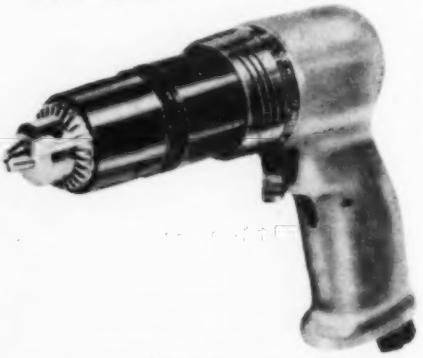
Model 920 uses only 2' x 2' floor space, requires only 30 cfm of air at 90 psi with a ⅛" air jet. It can be connected to any 110 volt outlet.

Metal Improvement Equipment Company, 1721 East 47th Street, Los Angeles 58, California.

Use postpaid card. Circle No. 41

New Portable Air Drills

A new line of powerful and compact air drills in straight and offset models has been introduced by Thomas C. Wilson, Inc. Series 93 drills have a drilling capacity up to ⅜ in. and a choice of seven speeds for efficient drilling of a wide range of materials including steel, cast iron, brass, aluminum, and plastics.



Series 93 drills are available in straight models which lever throttle or pushbutton throttle, and offset grip models with trigger throttle. Weight ranges from 2⅛ to 3⅞ pounds. Speeds available from 500 to 15,000 rpm.

Thomas C. Wilson, Inc., 21-11 44th Avenue, Long Island City, New York.

Use postpaid card. Circle No. 42

Cutter Grinding Fixture

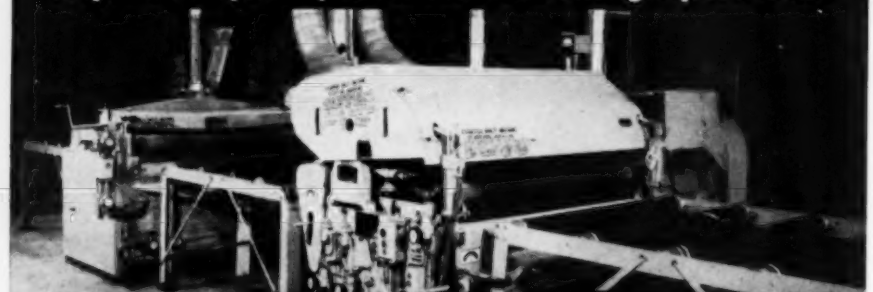
A new low-cost cutter grinding fixture makes it possible to grind and sharpen plain milling cutters up to 6" in diameter on a horizontal surface grinder. It is suggested that in many shops the fixture will eliminate the need for a universal tool and cutter grinding machine. Cutters with bores of ⅞", 1", and 1¼" can be handled.

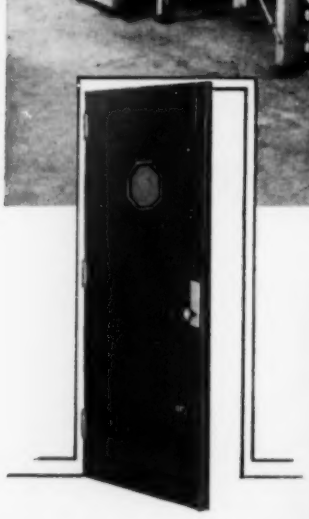
A Meehanite casting, with all working surfaces hardened and ground, the fixture is priced at $42.50.

Montgomery & Co., Inc., 401 Morris Avenue, Springfield, New Jersey.

Use postpaid card. Circle No. 43

Here's how TRUSSBILT . . . opened the door to improved quality in metal finishing operations





The TRUSSBILT DIV. of Siems Bros., Inc., St. Paul, Minn. . . . a leading manufacturer of flush steel doors used throughout the world; recently installed a tandem set-up of Timesaver "Speedbelt" Sanders in their steel door finishing line. Using a Model TOP and Model SPL, both face sheets of the doors are given a rough finish on the first pass through the line.

Low spots are then filled and doors are put through the line a second time for finishing. This provides a tremendous production advantage over previous hand operated methods, while eliminating variations in finish quality. The Timesaver line can handle approx. 100 doors an hour. This high speed finishing operation precedes dipping and baking operations, efficiently removing weld blemishes, while lowering high spots and smoothing out filled in valleys.

TRUSSBILT's experience is typical of Timesaver "Speedbelt" installations throughout the country . . . where the needs for better quality, better production and lower units costs is important. You, too, can enjoy the advantages of wide abrasive belt finishing and polishing in your shop at a minimum of cost. Investigate the advantages of Timesaver "Speedbelt" Sanders for your metal finishing and polishing operations, now!

TIMESAVER SANDERS

Write Today . . .

Send for literature and prices . . . or request an analysis of your finishing problem. No obligation.

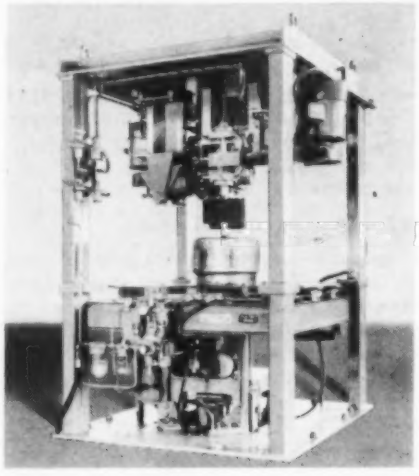
Dept. R-7
Box 7446 • Robbinsdale Station
Minneapolis 22, Minn.

Use postpaid card. Circle No. 241

Automatic Deburring Machine

A machine which automatically deburrs holes in such items as automatic washer and dryer baskets in preparation for spray-finishing has recently been produced by Murray-Way Corporation.

Utilizing four wire brush heads, this machine will completely deburr a washer or dryer basket in a ten second cycle. Three operations occur simultaneously. Two of the wire brush heads deburr the holes on the outside of the basket; another wire brush head deburrs the holes in the bottom of the basket; while the fourth brush removes the scale from the inside welded seam which secures the sides to the bottom of the basket.



This new machine may be used either as an individual unit or as a part of an automated production line. When it is used as part of an automatic form and weld line, the baskets are moved from one machine to another by means of transfer arms. As a basket reaches this deburring machine, it is raised into brushing position and rotated while the four wire brushes complete the deburring action. Then it is lowered into pass line position where the automatic transfer arms remove it and replace it with another basket for deburring.

Murray-Way Corporation, P.O. Box 180, Birmingham, Michigan

Use postpaid card. Circle No. 44

Grinding Unit Serves Dual Aims

Space and time saving by elimination of one machine and of need for clamping and chucking, as well as reduction of spotting time, are among the benefits of the new Rodex metal grinding and indexing unit developed by Eight Mile Industries, Inc.

In the design of the Rodex, a powerful rotary grinding table fits on a surface grinder to convert it to a rotary and/or O.D. grinder. Use of a permanent magnet chuck on the surface means little or no clamping is required, meaning obvious savings in time.

Moreover, substantial saving in floor space results from elimination of use of an extra machine. The motor of the unit is reversible, permitting rotation in either direction.

Eight Mile Industries, Inc., 21290 W. Eight Mile Road, Detroit 41, Michigan.

Use postpaid card. Circle No. 45

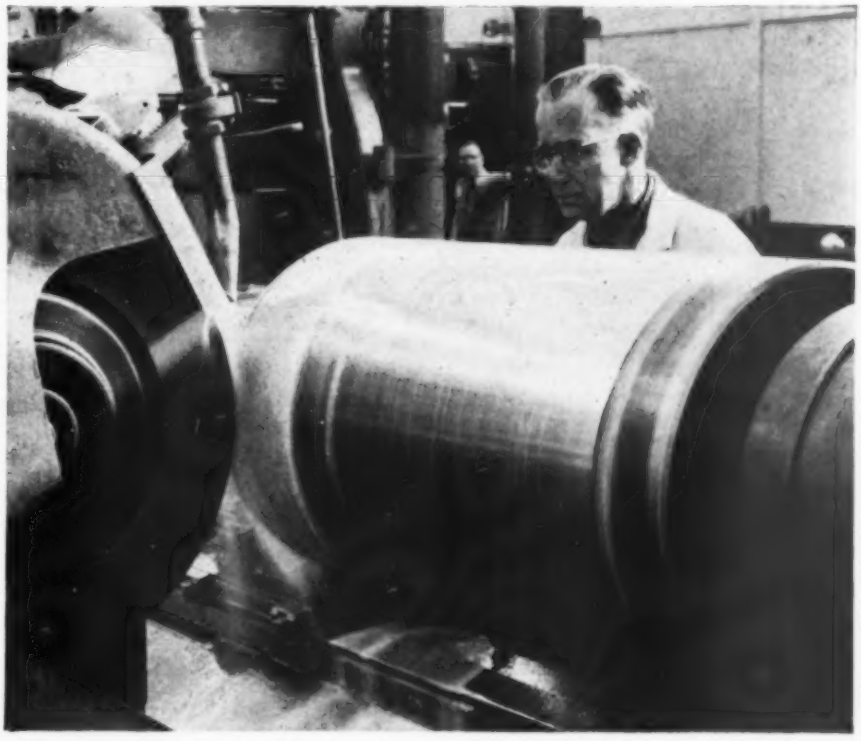
High-Capacity Coolant Filter for Water-Soluble Oils

Following extensive research and development as well as on-the-job application, an entirely new, fully automatic, high capacity Vacu-Matic filter for handling water soluble oil coolants in quantities from 200 to 2500 GPM is now available from the U. S. Hoffman Machinery Corp.

Use of the Hoffman Vacu-Matic filter in grinding and machining operations makes it possible to obtain higher speeds, faster feeds and better finishes.

Among the benefits and advantages claimed for the new Vacu-Matic filter

Where the wheel meets the steel . .



"Jobs change—but coolant doesn't with W&B E-55 in this Norton Grinder!"

"We can never tell what tough job is coming up next in this cylindrical grinder," says Mr. Ellis E. Carlson, Jr., General Foreman of Norton Company's Central Service Department. "It may be stainless (like the job shown here) or any number of nonferrous metals, alloys or steels.

"We do know that, no matter what the metal, W&B Grinding Coolant E-55 will do the job! It gives us good cooling; keeps the wheel clean and free cutting. And we don't have to clean the tank as often.

"On top of that, E-55 doesn't foam; settles chips fast; and gives good rust protection. It makes a clean, transparent coolant that doesn't smell bad and is easy on the hands." What more could you ask?

Send for a FREE working sample of W&B E-55! Write coolant tank size, plus make and type of grinder and typical jobs . . . on company letterhead. Mail to The White & Bagley Co., 88 Foster Street, Worcester, Mass.

W&B INDUSTRIAL LUBRICANTS

THE WHITE & BAGLEY CO.

Worcester, Massachusetts • Detroit, Michigan

Originators of Grinding Lubricants

Use postpaid card. Circle No. 242

are virtual elimination of down time, protection against loading of grinding wheels, delivery of dry sludge without coolant carry-over, a reduction in maintenance costs and longer useful life of equipment, oils, coolants.

U. S. Hoffman Machinery Corp., Filtration Division, Thompson Road Plant No. 1, Syracuse, New York.

Use postpaid card. Circle No. 46

Drill Grinder Boasts Longer Wheel Life

A newly-designed drill grinder, by The Black Diamond Saw & Machine Works, Natick, Mass., includes a stand which permits the entire grinding wheel to be used, thus increasing wheel life. Drills can be positioned for grinding at any point on the wheel face.

Diamonds in wheel dressers are presented to the grinding wheel at a 15° angle for self sharpening. The periphery of the wheel is dressed at a 5° angle, assuring sharp wheel edges for web thinning.

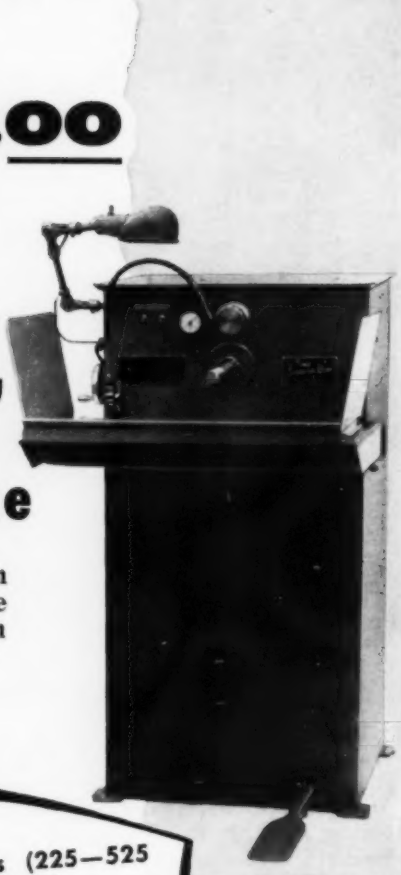
Mist coolant is provided.

You Asked for It !

Here it is at only

$495.00

The NEW SUPERIOR MODEL "J2" Honing Machine



Automatic honing in production runs, tool room work and salvage operations is now within the reach of everyone.

FEATURES:

★ Infinitely variable spindle speeds (225—525 rpm standard; 450—1050 rpm optional.)
★ ½ HP, 110-V, 60 cy. single phase motor.
★ Complete drive, motor and removable 14-gal. coolant tank enclosed in ventilated heavy steel base.
★ Tray top. ★ Sealed ball bearing spindle. ★ Anti-splash screen. ★ Splash guards.

OPTIONAL:

★ Dial indicator.
★ Full width extension tray.
★ Filter tray with 3 settling baffles and burlap filter.

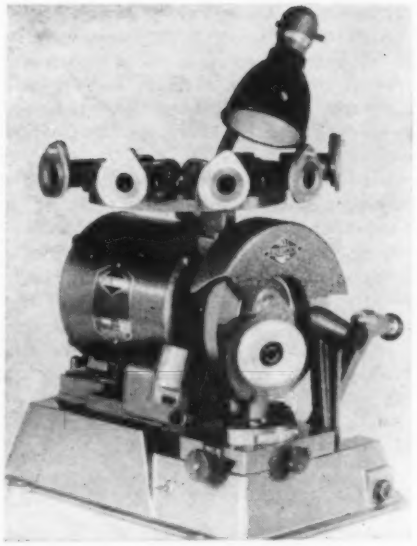
There's a Superior Honing Machine for Every Honing Job

Send for literature and prices

SUPERIOR HONE CORPORATION

1637 Elrene Street • Elkhart, Indiana

Use postpaid card. Circle No. 243



Distributed exclusively through Edward Blake Co., Inc., 570 Pleasant Street, Watertown 72, Massachusetts

Use postpaid card. Circle No. 47

New Small Air Grinders

Specially-adapted pistol grip models of the smallest air grinders in the Thor line are producing cost reductions in metal finishing at the B & D Window Company, Alton, Ill.

Wayne Buttry, plant superintendent, describes the new pistol grip Thor grinders as the "lightest, best-designed grinders we have handled." B & D depends upon the grinders for faster, higher quality dressing down of corner welds (photo) on aluminum window joints and for other finishing and fitting jobs in window and door construction.

The Thor pistol grip air grinders are Model 2GP-12000 developed by Thor Power Tool Company, Aurora, Ill.

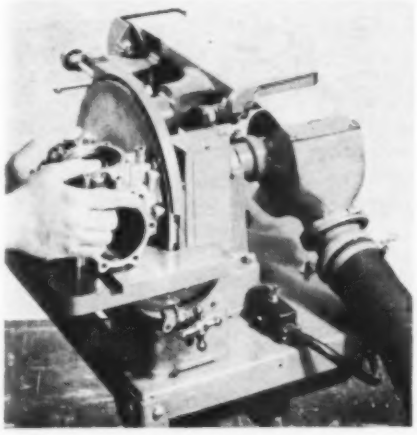
Use postpaid card. Circle No. 48

Abrasive Belt and Disc Finishing Machine

A new combination belt and disc finishing machine, said to be capable of performing 90 percent of all shop finishing operations, has been introduced by Rockwell Manufacturing Company's Walker-Turner Division. According to the manufacturer the new machine is useful in shops of all sizes from the local automotive repair shop to the largest metalworking plant.

The Walker-Turner combination finishing machine—with standard 4-inch abrasive belt and 12-inch abrasive disc

—was designed for use where custom or production finishing operations must be performed efficiently and economically.



The new machine is particularly applicable for sharpening tools. A specially designed idler drum guard facilitates hollow grinding of wood chisels, lathe chisels, carving tools, and plane irons.

Price, without stand and motor is $134.50.

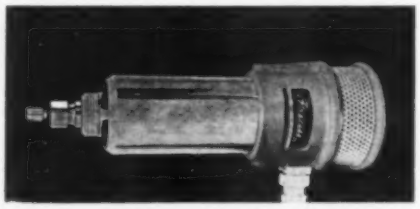
Dept. 1013, Walker-Turner Division, Rockwell Manufacturing Company, 400 N. Lexington Avenue, Pittsburgh 8, Pa.

Use postpaid card. Circle No. 49

Power Quills and Converters

A complete program of new Super Cycle power quills and portable, multi-speed high frequency converters is now in full production at Precise Products Corporation.

The new power quills (illustrated) are said to run at constant speed under load in a range from 7,200 rpm to 54,000 rpm with power output at the



chuck available up to 2 hp. Three basic models are fully interchangeable with the company's universal power quills.

The converters are compact single and four-speed models, as well as the new continuously variable units in a range from 12,000 to 60,000 rpm.

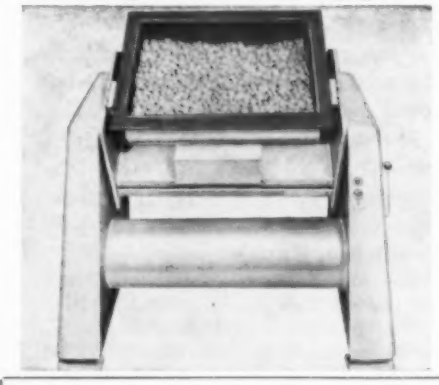
Precise Products Corporation, 3715 Blue River Road, Racine, Wisconsin.

Use postpaid card. Circle No. 50

New Vibrator for Deburring, Descaling, Surface Finishing

The Stevenson Company announces the development and marketing of a new and revolutionary piece of equipment, the "Stevadoer," that can be utilized as a vibrator for mixing, pulverizing, deburring, descaling; cleaning and screening; grading stones; or for surface refinement of any metal parts.

This unique and novel design concept enables maximum tumbling with minimum movement and current consumption. 100% of the media is vibrated in the tub, with negligible vibration transmitted to the base itself, thus requiring no bolting down of the equipment,



which can readily be moved from place to place. The suspension system permits angular positioning of the tub, while maintaining vibration of the media and parts in any position. In the inverted position it serves to screen the materials. Provisions are made for obtaining various degrees of flow of parts and varying the amplitude of vibration.

tion.

The Stevenson Company, Wellsville, Ohio.

Use postpaid card. Circle No. 51

"Most Accurate" Radius Dresser

A newly engineered and redesigned Model SS radius dresser, maintaining an accuracy of .0002", is reportedly one

Wider lip design of ATLANTIC Resin-Bonded CUP WHEELS provide maximum strength for continuous high-speed smoothing jobs. Faster, safer – wheels from 2½" to 8" are speed tested at 50% higher than normal snagging speeds . . . wear longer, seldom need to be dressed. Good reasons why you keep cutting costs down with Atlantic Wheels.

Atlantic Abrasive Corp.

A DIVISION OF ABRASIVE PRODUCTS, INC.

South Braintree 85, Massachusetts

STRAIGHT WHEELS • CYLINDER WHEELS • CUP WHEELS

CONES • PLUGS • MOUNTED WHEELS AND POINTS

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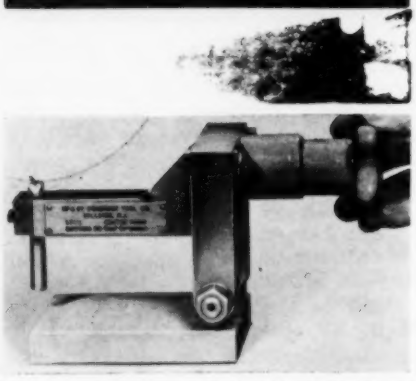


of the most accurate dressers on the market today.

The Model SS dresses all wheels up to and including 12" in diameter. Dressing the wheel from below eliminates the necessity for removing the wheel guard during the operation.

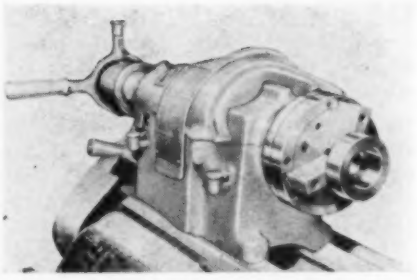
Four stop pins allow complete adjustment from 90° through 180°.

Somerset Tool Company, Hillside, N.J.

Use postpaid card. Circle No. 52

Precision Chuck

The Model 1000 5" Precision Chuck, for use on high speed precision lathes, boring machines, and grinders, is said to be accurate to less than .0005". It



will hold work up to 3½" dia. on the O. D. or I. D. The chuck has a ¾" hole through it, which permits coolant to be piped through the spindle. The chuck can be operated either by an air cylinder or by a lever-type collet closer. The operator can change over from the chuck to collets in a few minutes.

The face of the chuck extends only 1⅜" beyond the end of the spindle. The chuck weighs only 8½ lbs.

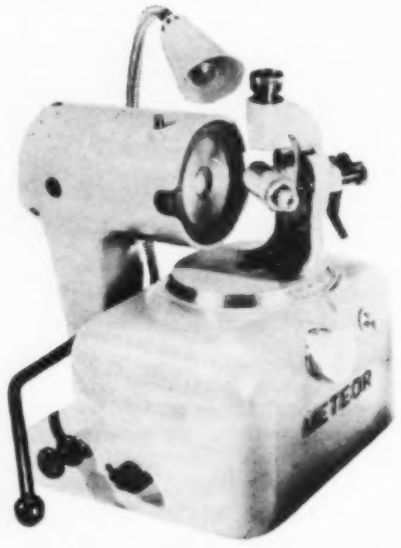
A PowerGrip actuator provides controlled and uniform holding pressure, regardless of variations in the workpiece diameter.

PowerGrip, Inc., Rockfall, Conn.

Use postpaid card. Circle No. 53

New Twist Drill Grinder

The new KBS-6 Meteor twist drill grinding machine was designed for sharpening milling cutters and right and left hand twist drills from 0.008" to 0.236" in diameter and up to 6¼" long. Models for larger drills are also available. Point angle is adjustable from 90-180°, relieving is adjustable from 0-20°, and a high precision four jaw chuck allows the tool to be clamped and unclamped instantly.



This Meteor KBS-6 twist drill grinder weighs only 37½ pounds, and occupies a bench top space of 13" x 10" x 15½". Its drive motor operates on any standard 110V, 60 cycle power source. Simple to operate, anyone can grind precisely instruction with this machine after -0 minutes.

Associated American Winding Machinery, Inc., 750 St. Ann's Avenue, New York 56, New York.

Use postpaid card. Circle No. 54

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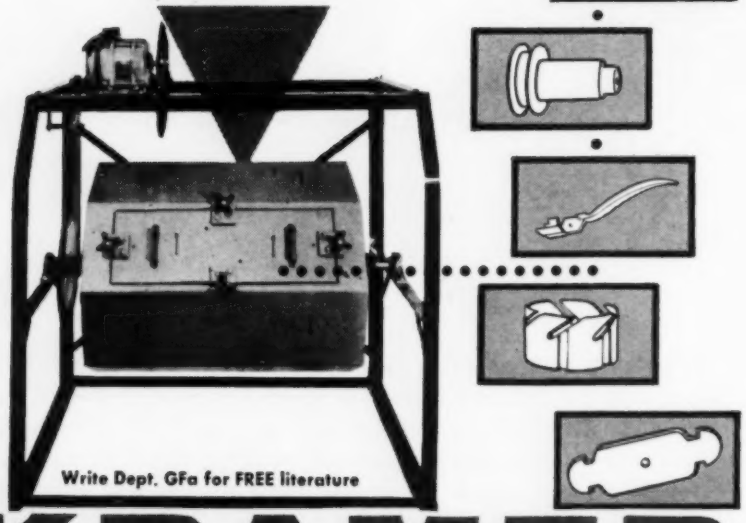

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120-30 Jamaica Avenue, Richmond Hill 18, N.Y.

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Heavy-Duty Machine Tool Spindle

The DoALL Company announces the addition of a heavy-duty, tapered, roller bearing spindle to its line of machine-tool spindles. The belt-driven spindle is designated as model BD4-2 and is rated up to 2,700 rpm.

The use of four tapered roller bearings permits this spindle to take high radial and thrust loads. It is therefore recommended for heavy-duty applications such as crush grinding, roll grinding and vertical spindle grinding.

Although designed for heavy-duty service, model BD4-2 spindles have the same accuracy as other DoALL spindles. This is acheived by carefully preloading the tapered roller bearings. Each spindle has a pair of opposed bearings at each end.

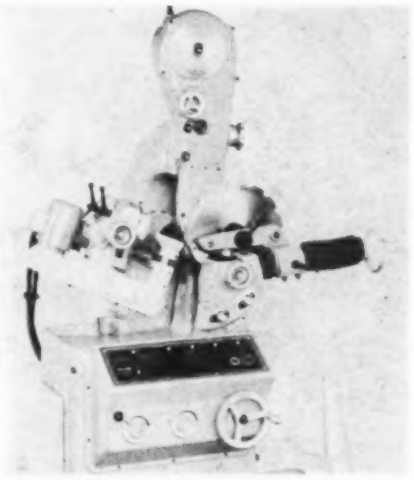
At the grinding wheel end the bearings are fixed and located as close to the wheel mounting nose as practical to give maximum support and rigidity. The second pair of preloaded bearings float near the pulley end of the spindle. This new heavy-duty spindle is available for replacement, for use on special machines and for tooling. The barrel diameter is 4.1241 in. and 16 49/64 in. long. Standard nose taper and pulley mounting are used. Maximum recommended drive is 7½ hp and maximum wheel size is 14 in. dia. by 2 in. width

The DoALL Company, Des Plaines, Ill.

Use postpaid card. Circle No. 55

Automatic Grinding Machine for Carbide-Tipped Circular Saws

The Vollmer automatic saw blade grinding machine for carbide tipped circular saws, Type ASHK-1000 is available in two models. Model A is used primarily for resharpening, while Model B is basically for manufacturing.



Both models can grind the face or the top straight or with alternate bevel. Model B also grinds the sides of the carbide inserts with compound clearance angles.

Grinding capacity includes saws from 5" to 40" in diameter, with tooth distance up to a 4" maximum.

W. Von Arnauld Co., P. O. Box 92, Pompton Lakes, New Jersey.

Use postpaid card. Circle No. 56

New Honing Stone Selection Kit

Designed to facilitate rapid selection of the most suitable stone for bore sizing and finishing requirements in the ⅛" to 2⅝" diameter range, Sunnen's new LN-610 Precision Graded Stone Selection Kit is reported to cover all honing needs encountered in everyday shop work.

Supplied in a steel cabinet with sturdy plastic drawers, assortment provides 224 stones in 72 varieties of abrasives and stone sizes, for deburring, stock removal and finishing operations—all conveniently separated in drawer compartments. Selection guides, on drawer fronts, identify contents and aid in choice of right stone for each job. In addition, all stones are code numbered for positive identification.

Dept. F-18, Sunnen Products Company, 7910 Manchester Ave., St. Louis 17, Missouri.

Use postpaid card. Circle No. 57

Standard, Prefabricated Chute Support Columns and Yokes

A varied line of standard, prefabricated chute support columns and yokes is now on the market.

These items are used to support gravity feed chutes, as for instance, between parts feeders and processing machinery.

Mrs. Florence Smith, operator of the Federal Products Corporation, achieves ultra-precise results with the No. 3 Moore Jig Grinder.

Woman operator at Federal Products maintains 50 millionths accuracy with No. 3 Moore Jig Grinder

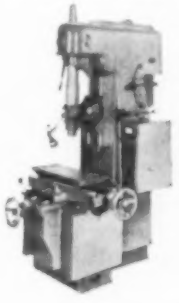
Moore Special Tool Company numbers among its long-time customers the Federal Products Corporation of Providence, Rhode Island—a leading manufacturer of dial indicating, air, electric or electronic gages—special equipment used for measuring, inspecting, sorting or automatic gaging.

The type of work produced by Federal Products calls for highly skilled personnel, not the least talented of which is a woman jig grinder operator, Mrs. Florence Smith.

Mrs. Smith has a *natural* mechanical ability. She is Federal-trained, starting in their plant during World War II. Most of her work is producing masters for precision gages with small holes and slots. Her work is extremely accurate—and she keeps complete records of work performance. She is able to maintain accuracy to within 50 millionths...using the No. 3 Moore Jig Grinder.

Moore machines have been dependable performers in Federal Products Corporation's precision grinding room for a number of years. The company also uses other Moore equipment, such as the Moore Precision Rotary Table and Moore accessories...all of which help Federal meet their customers strictest requirements.

Write today for literature describing all the advantages of the No. 3 Moore Jig Borers and Jig Grinders.



Partner in Precision: No. 3 Moore Jig Borer

This new Moore Jig Borer is unequalled for the speed and accuracy with which it bores, drills, reams and spots holes in dies, jigs and production parts. It breaks the "tenth barrier." It offers more precise positioning tolerances...improved drive ...wider speed range, 60 to 2250 RPM...larger table working surface, 11 x 24".

MOORE SPECIAL TOOL COMPANY, INC.
725 Union Avenue, Bridgeport 7, Conn.

HOLES, CONTOURS AND SURFACES. Tells how to produce tools and dies the modern way. 424 pages, 495 illustrations. $5 in U.S.A. $6 elsewhere.

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JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

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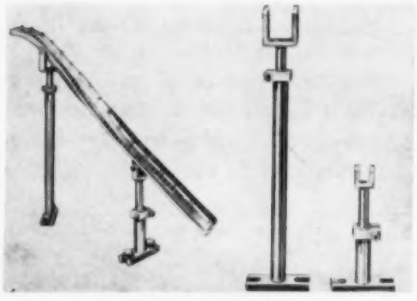
Vertical adjustment is provided to allow for height variations, and the yokes can be rotated a full 360°. Yokes as furnished allow for modification by bending, cutting, welding, etc., to obtain large or small support areas as required.



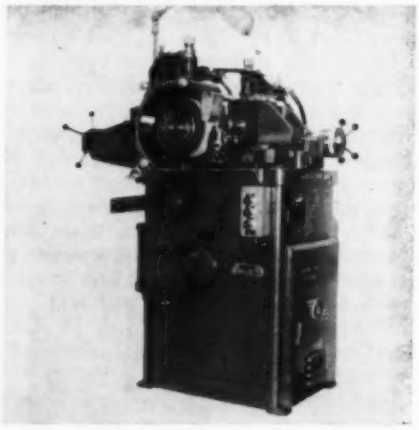
Support columns and yokes are available in sizes classified for use with definite parts feeder models, or they may be used as desired within the limitations of their dimensions.

Syntron Company, 1253 Lexington Avenue, Homer City, Pa.

Use postpaid card. Circle No. 58

New, Moderately-Priced Centerless

Royal Master Grinders, Inc. have added a new, high precision, moderately priced, centerless grinder with a permanently mounted crush dresser designed for thrufeed, plunge feed and infeed, to their line.



This model, CG-12, is 24" x 48" including coolant tank, and grinds multiple diameter parts and intricately shaped profiles. It can grind a variety of materials such as tungsten carbide, stainless or carbon steel, glass or plastic to .0002 or 6 or 8 micro finish. It also grinds wood, non-ferrous metals, fibre, hard rubber, ceramics and cork.

It features massive heat-treated alloy spindle with ball bearings lubricated for life . . . wheel dressers can be either manually or hydraulically operated . . . mounted wheel is easily lifted by one man . . . regulating wheel spindle is mounted "between" ball bearings to prevent deflection.

Royal Master Grinders, Inc., 272 Highway 23, Riverdale, N.J.

Use postpaid card. Circle No. 59

Aluminum Fans Now Standard on Some Aget Dust Collectors

Aget Manufacturing Co. has just announced the development of a new spark proof, cast aluminum fan for use in their dust collectors.

This unit is said to have many advantages over the standard steel or plate fan. It is lighter in weight, and blades are moulded into position for greater strength and rigidity.

In the past, cast aluminum fans have been available as special equipment, but at an added cost of from $40.00 to $100.00. Now with the new design and manufacturing techniques they are offered, without additional cost, on the standard Model 800, 1100 and 500 series Dustkops.

Aget Manufacturing Co., 1384 Church Street, Adrian, Michigan.

Use postpaid card. Circle No. 60

Small Bore Adapters for Surface Finish Measuring Unit

Two models of small bore adapters which extend the utility of the Surf-indicator (unit for measuring surface finish) to very small internal diameters

Now! see the NEW!
K. O. LEE GRINDERS
. . . the World's Most Versatile Grinding Machines!

The Model BA960 Universal Grinder is a result of over 30 years of experience in the manufacture of precision grinding machines, attachments and fine tools.

This machine is the biggest value in the industrial market. A truly universal machine, spindle speeds from 3450 to 20,700 RPM with standard equipment included, capable of handling all types of O.D., I.D. grinding operations demanded by the average shop.

K. O. Lee grinders have proven themselves year after year in the metal working industry. They have outsold all other grinding machines in their field.

We invite you to visit our Distributors. Compare this machine for quality, engineering, workmanship, sturdy construction and modern appearance against any machine on the market. See for yourself how much more you get for how much less you pay.

We believe that you will be pleasantly surprised.

Model BA960 Universal Grinder
SHOWN WITH B943 MOTOR-DRIVEN WORK HEAD AVAILABLE AT EXTRA COST

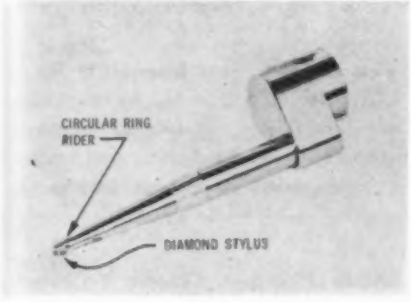
For Complete Information Write for Grinder Catalog TG-1 Which Lists Other Models and Fixtures

K. O. Lee Co.
ABERDEEN, SOUTH DAKOTA

Use postpaid card. Circle No. 247

and other limited access areas are now available.

Model BL-113 is designed for use with Brush motor drive Model BL-117. This adapter penetrates up to 3/16" into an opening with an ID as small as ⅛". Model BL-134 is designed for



use where hand-held operation is necessitated by the location of the surface to be measured. It is particularly well-suited for periodic checks during machining operations.

Brush Instruments, Division of Clevite Corporation, Cleveland, Ohio.

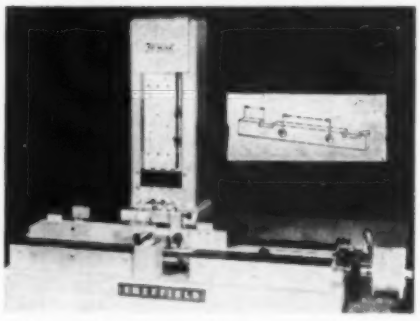
Use postpaid card. Circle No. 61

Gage Measures Slot Location to Millionths Accuracy

The location of slots as small as .050 and smaller holes in long parts such as microwave components and computer bars can be measured to less than a tenth accuracy with a new Precisionaire® inspection instrument announced by The Sheffield Corporation, a subsidiary of Bendix Aviation Corporation.

The instrument inspects hole location and center distance, slot width and depth of various shaped cavities in rectangular and round parts of various thicknesses and widths up to 12" long. Models for measuring other size parts can be supplied.

The gage consists of a precision-built gage table and a three-column Precisionaire instrument. A Sheffield one-inch micrometer is located at one end of the gage table. This ultra-precise



micrometer, guaranteed accurate to ± .000010 per inch, is used in conjunction with end standards to set the part print dimension in the gage against which the actual location of the holes and slots in the part is checked.

The Sheffield Corporation, Dayton 1, Ohio.

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Portable Electronic Gaging Unit

More compact and versatile than former models, this amplifier for ElectroProbe gaging is only 6¼" wide, 4-11/16" high and 5¼" deep, yet everything is contained in one unit. No separate carrying case is needed. The

precision gage head operates with a gaging pressure of only 2.5 grams, permitting its use anywhere without the need for heavy weight stands. Dual range zero adjustment is featured.

Federal Products Corp., 1144 Eddy St., Providence, R.I.

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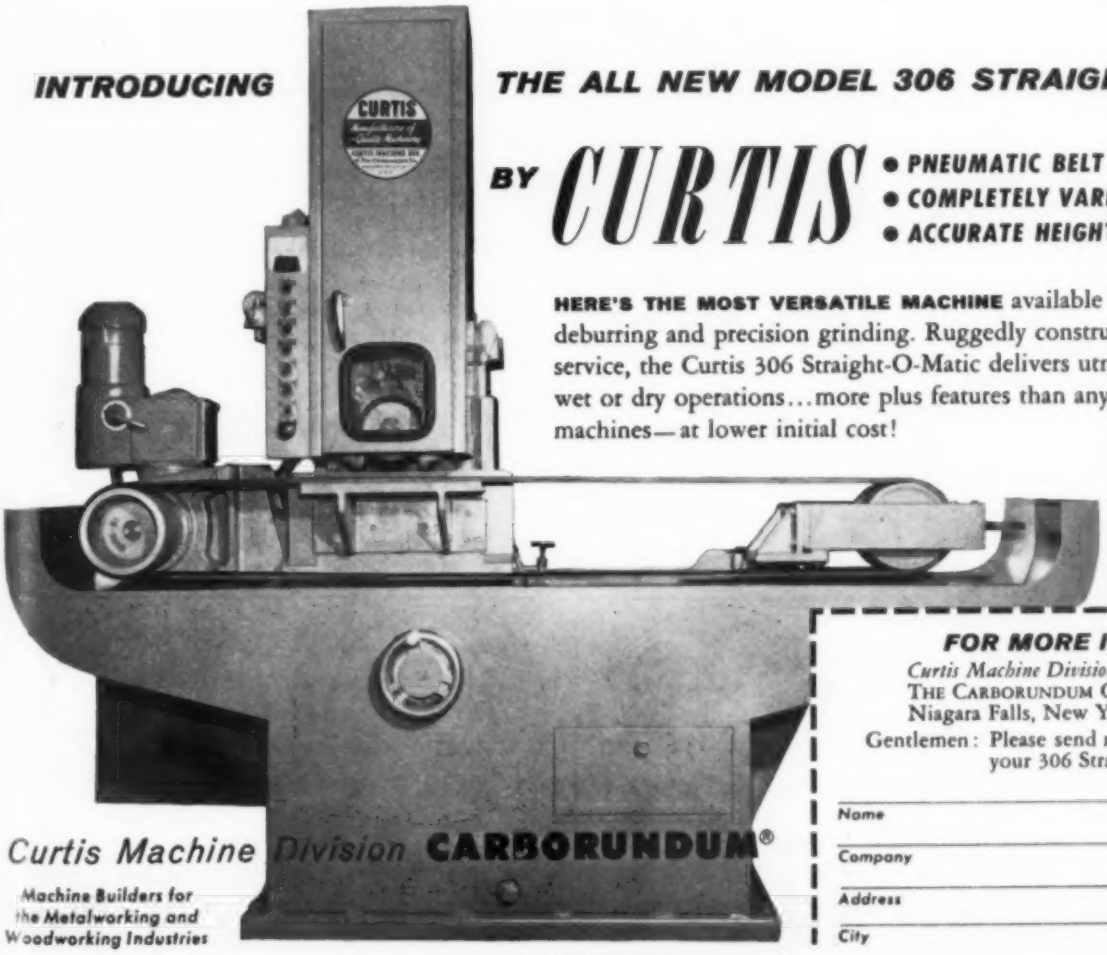

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Curtis Machine Division
THE CARBORUNDUM COMPANY, Dept. GF
Niagara Falls, New York

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It is no longer necessary to tolerate costly machine repairs and limited use of your equipment because of rust and corrosion caused by electrolytic fluids which contain harmful materials. ELECTROGRIND will not deposit heavy salt on machine or parts. Operators appreciate ELECTROGRIND because it *does not* irritate their eyes or skin.

Arcing is greatly reduced over ordinary electrolytic solutions made from powders. Less arcing means *longer wheel life* and *better surface* finish.

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Metalloid manufactures premium cutting fluids for all types of metal machining and grinding.

EASTERN DISTRIBUTOR OF *New* **KOOLMIST** *the world's finest* **MIST** Coolant System
Mfg. by Lloyd Tool Corp., Pasadena, Calif.

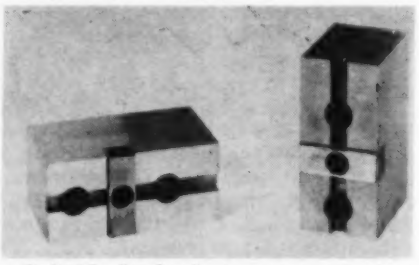
METALLOID CORP.

HUNTINGTON, INDIANA

Use postpaid card. Circle No. 249

Expanded Soft Blank Chuck Jaw Line

Gahr Machine Co. has expanded its line of soft blank chuck jaws so that now it offers a complete selection from stock for all users. Users can now order their choice of jaws for air chucks, hand or power operated geared-scroll chucks, two-jaw and four-jaw independent chucks, and combination chucks. Because they're produced in volume, they are said to cost less than comparable original manufacturers' equipment.



Soft blank chuck jaws come in two different heights. They're available in standard short-jaw (Style S) and long-jaw (Style L)) models. Mounting faces are precision ground on all American Standard jaws. Close American Standard tolerances on tongues and grooves insure accuracy and interchangeability.

Gahr Machine Company, Cleveland, Ohio.

Use postpaid card. Circle No. 64

Free Lock Screw Locating Jig

To enable engineers, foremen and operators almost instantly to determine precise location for drilling and tapping of lock screws, a plastic lock screw locating jig is now available free on request.

Acme Industrial Company, Chicago, Illinois.

Use postpaid card. Circle No. 65

Clinch Rings with Steel Overlap for Air-Cooled Buffs

Newly-developed clinch rings with steel overlap at the weld are now used as standard components on all air-cooled buffs manufactured by American Buff Company.

A projection welding procedure, a new method of die-forming teeth, which produces stronger and larger teeth than before, and the steel overlap provide such a secure grip that both

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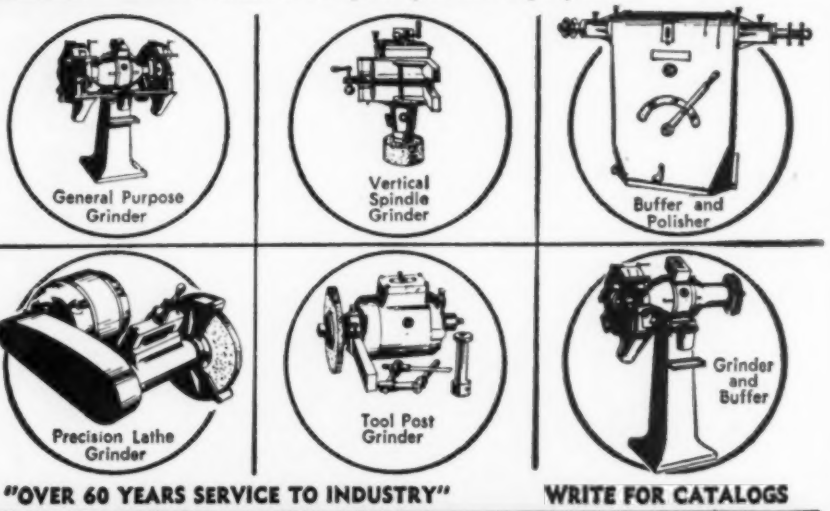

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3640 LLEWELLYN ST., CINCINNATI 23, OHIO

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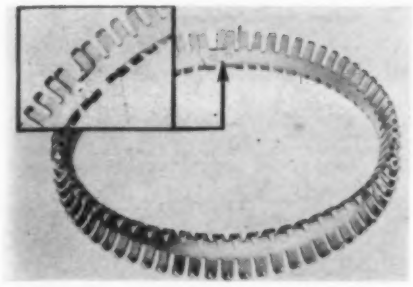

puckered and unit type buffs can be made of heavier fabrics than before.

American Buff Company, Chicago, Ill.

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Easy Window Installation Marks Low Cost Face Shield

A fibre band with three positive snap fasteners to secure either clear or green acetate windows to the wide fibre spark guard, permitting easy installation and replacement of windows, is a feature of a new "Spartan" Series 6400 face shield.

Windows come in 4", 6", and 8" lengths and in .020 and .040 thickness, packed individually.

Welsh Manufacturing Co., 24 Magnolia Street, Providence, R.I.

Use postpaid card. Circle No. 67

New Precision Surface Grinder

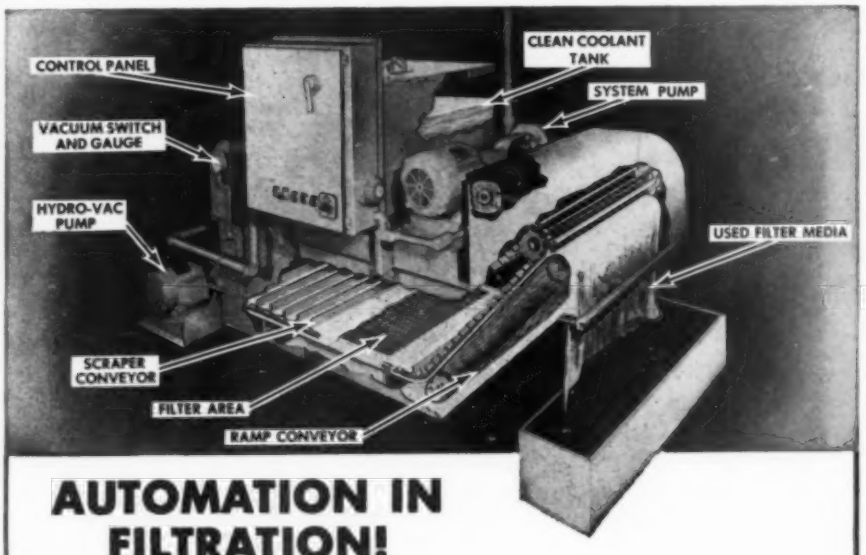
A 6" x 12" ELB Jewel precision surface grinder has been added to this line of grinders. Its cross-feed, infinitely variable from 0" to 1¼" per stroke, is said to utilize the full ¾" width of the wheel with every stroke.

The new grinder operates with a mechanical drive 2.5' to 50' per minute, and an electro-mechanically controlled cross feed. The cross feed can be moved

0.0005" per division, and the vertical feed, 0.00025" per division.

Aaron Machinery Co., Inc., New York, New York.

Use postpaid card. Circle No. 68



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The only complete line of grinding wheel dressers and cutters

Desmond

Desmond-Stephan Mfg. Co.
Urbana, Ohio

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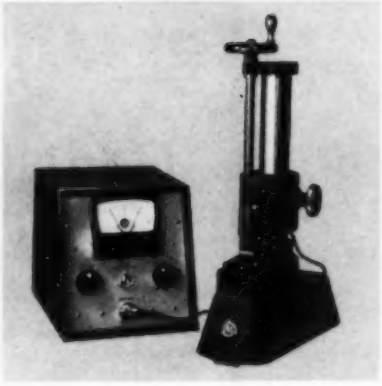
how to MICROtrol*

machine tools...

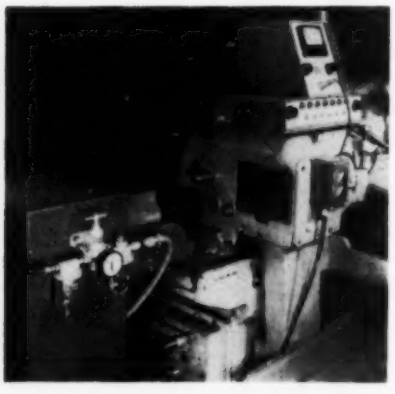


for MICROtolerance Inspection

The *MICRO*trol Standard Comparator Amplifier (16011) shown here is one of four units designed for precise, reliable dimensional inspection in a variety of applications. The building block concept makes all *MICRO*trol units extremely versatile as components of either user–built or AIL custom-built systems.

for Fast Automatic Selection

Operated in combination with selected accessory units the 16011 amplifier is readily adapted to automatic sorting. Here it is shown with the *MICRO*trol 16082 classifier in a high precision production sorting operation.



for Precise Continuous Control

The addition of appropriate logic and decision making *MICRO*trol units provides complete feedback control. A typical system, shown here, combines the accuracy and reliability of *MICRO*trol units with our unique linear actuator . . . . . the INCHWORM*

*Trade Marks

LET US PROVE this outstanding electronic gaging and control equipment in your plant!

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DEER PARK, LONG ISLAND, NEW YORK

A DIVISION OF CUTLER-HAMMER INC.

CONTROL

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News from the Industry

International Standards for Machine Tools Under Review

Two international standards for machine tools have been approved by member nations of the International Organization for Standardization (ISO) and submitted to the ISO council for acceptance as ISO recommendations. A number of others are under consideration.

The two approved cover lathe tool posts, and speeds and feeds for machine tools. Four others being circulated for approval deal with 5% taper for tool shanks, lather centers, 7/24 tapers, and symbols appearing on the controls.

The last subject is aimed at substituting word descriptions with symbols that can be understood in any country in which a machine may be used.

The proposals were prepared by the ISO technical committee on machine tools, meeting in Paris after the sixth European Machine Tool Exhibition.

The next meeting will be in Chicago in conjunction with the 1960 Machine Tool Exposition, September, 1960.

Master Setting Rings Certified to Three Millionths

Recently, three master setting rings, .43840 (Mean), 43842 (Max.), and .43838 (Min.) were made by The Sheffield Corporation, Dayton, Ohio, and calibrated and certified to an accuracy of ± three millionths by Sheffield's Eli Whitney Metrology Laboratory. Then they were sent to the National Bureau of Standards, Washington, D.C., which also certified them as being accurate within ± three millionths.

It is the first time the National Bureau of Standards has certified internal measurement to this accuracy. Conventionally, Bureau certification of internal diameters of this size is to ± 10 millionths.

According to the ring calibration certificates both laboratories reported identical dimensional value to the sixth decimal place on one ring, and on the other two rings, the variation was within a millionth part of an inch.

The result of this breakthrough in manufacturing and measuring rings to ± three millionths accuracy, now makes it evident that master setting rings can be supplied to this precision on a special basis—and the day is not far off when they will be supplied commercially.

New Cleaning Room Equipment Major Need of Foundries

A major share of the more than $509 million in capital equipment needed by America's foundries over the next two years will be invested in new and more efficient cleaning and finishing equipment, according to a study just completed by the American Foundrymen's Society.

Forty-nine per cent of all iron, steel, and nonferrous foundries singled out this area as a major need in 1960 and 1961.

Foundry size was indicated as a significant factor. Although 45% of the largest and 45% of the smallest foundries reported such needs, the proportion rose to 56% among medium sized plants.

Marketing Organization Formed

A new national marketing organization to be known as Cosmo Wheels, Inc., has established offices at 1019 West Fulton Street, Chicago, Ill.

The new firm maintains complete sales, service and warehouse facilities

Ten Japanese industrialists visiting U.S. plants pause in their tour of the DoAll Company, Des Plaines, Illinois, to view the company's Hall of Progress, in which the leading events of the Industrial Revolution are portrayed. Milton E. Hlava of the public relations department explains one of the features, a display called "The Dawn of This Age."

WALLS TU-WAY BELT SANDER

USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little..

complete with cord, plug, switch ready to use

$89.95

Illustrated Literature on Request

A few desirable distributor territories still available.

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333 Nassau Avenue Brooklyn 22, N. Y.

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for national distribution of standard contact wheels and other products of Chicago Rubber Company, Inc., and the newly-developed and patented Cosmo R-100 molded rubber contact wheel.

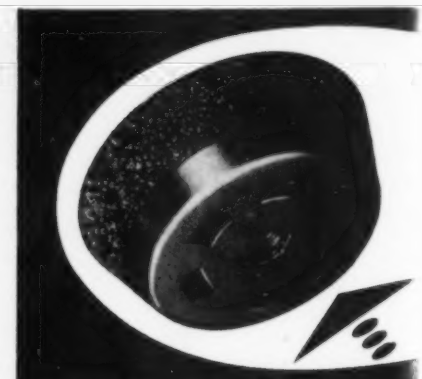
New Office, Warehouse

Opening of a new combination warehouse and branch office at 1025 Greeley Avenue, Union, New Jersey, has just been announced by Besly-Welles Corporation of South Beloit, Illinois.

New Company To Handle Coated Abrasives Firm Moves to Detroit Area

Charles B. Quarnstrom, president, Coated Abrasives, Inc., has announced that transfer of manufacturing and headquarters operations from Milwaukee, Wisconsin to the Detroit metropolitan area has been completed.

The company's new manufacturing plant is located in Warren, Michigan. General staff offices are at 11920 East Eight Mile Road, Detroit 5, Michigan.



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DUE TO COOLANT PUMP FAILURE

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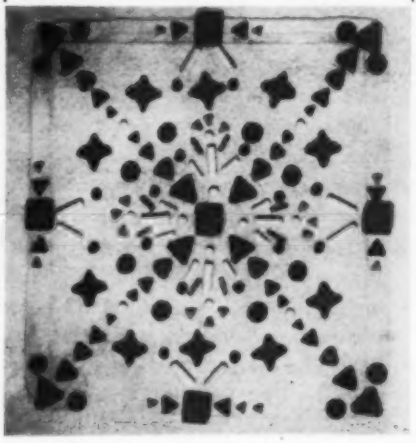

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Changing Faces . . .

H. R. Skifter

Dr. Hector R. Skifter has resigned as assistant director of defense research and engineering (Air Defense) to return to his position as president of Airborne Instruments Laboratory, Long Island, New York, a division of Cutler-Hammer. **Harry M. Stephey** has joined AIL as manager of military sales.

In a recent meeting of the board of directors of the Mid-West Abrasive Co., Owosso, Michigan, **Arthur C. Reppenhagen, Jr.**, sales manager and **Harlow G. Jones**, director of research and product development, were elected vice presidents. **Donald P. Wietzke**, auditor, was named assistant secretary.

W. J. Bennett

In a reorganization of its coated abrasive sales organization, Behr-Manning Co., of Troy, N.Y., has named **William J. Bennett** national field sales manager. **Victor F. Perrault** and **Arthur W. Bell** were made regional sales managers, eastern and western divisions respectively.

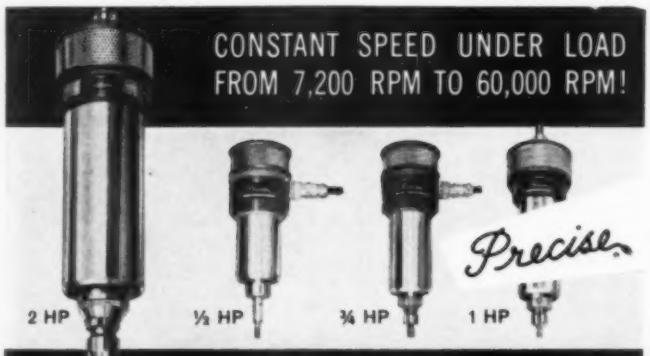
Ray Nixon, former chief engineer of Beaver Tool & Engineering Co., has joined the R-O Manufacturing Co. staff as assistant sales director. R-O is located in Madison Heights, Mich.

Ray Nixon

Eugene A. Nicol has been promoted to general superintendent of production at the Maytag Company's Plant 2, in Newton, Iowa.

Four marketing supervisors for industrial trades have been selected by Minnesota Mining and Manufacturing Co., St. Paul, Minn.: **Edwin F. Goad,**

CONSTANT SPEED UNDER LOAD
FROM 7,200 RPM TO 60,000 RPM!



NEW SUPER CYCLE POWER QUILLS

Extend your range of precision grinding, milling and finishing—step into high production with the new line of Precise Super Cycle Power Quills. These new units provide constant speed operation with no speed drop under load . . . run at speeds from 7,200 rpm to 60,000 rpm . . . assure excellent surface finishes, longer life for abrasive wheels and carbide midget mills. Rotor has no windings, no commutator — never needs servicing. Super Cycle Power Quills (with converters) are available in four basic models — provide up to 2 hp output at the chuck. All Super Cycle Quills are interchangeable with Precise Universal Motor Power Quills.

CONVERTERS—Self-contained, portable converters for Super Cycle System. Single, four-speed and continuously variable models.

Precise

Grinder-Millers, Power Quills, Jig Grinders, Milling Machines, Automatic Drill Units, Cutting Tools, Vapor-Lub Cooling, Sklero Hardness Tester

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the diamond tools with a **NEW TWIST!**

Cost No More—Last Longer!

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ORDER ONE TODAY!

Shank and diamond sizes for all grinders. Send for FREE detailed literature. Distributor inquiries invited.

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NEW EQUIPMENT *continued*

finishing and cleaning materials for the basic metals industries; **Dayton E. Speer,** automotive trades; and **John B. Nyberg** and **Russell C. Stimely,** industrial trades.

The Gisholt Machine Co., Madison, Wisconsin, has appointed **Paul H. Gotstein** as direct sales representative for the Atlanta, Ga., district. **John J. Ellis** has been transferred to Chicago as salesman, replacing **Howard V. Myers,** who is retiring after nearly 25 years with the company.

The retirement of **William W. Turner,** secretary, after 42 years of service, has been announced by the American Emery Wheel Works, Providence, R.I.

Ralph A. McKinney and **Albert Whitelaw,** retired executives of Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N.J., died recently Mr. McKinney was 90 years old.

P. H. Gotstein

John N. Davis

John J. Ellis

H. V. Myers

John N. Davis has been appointed plant manager, Coated Abrasive Division, Armour Alliance Industries Alliance, Ohio.

New Distributor Appointed

The Sterling Grinding Wheel Co., of Tiffin, Ohio, has appointed Continental-Emsco as a distributor of their line of abrasive products.

Continental-Emsco, a division of The Youngstown Sheet and Tube Company, maintains division offices at Baton Rouge, Chicago, Dallas, Houston, Los Angeles, and Tulsa, through which Sterling products will be distributed, as well as through over 100 oil field supply stores and offices.

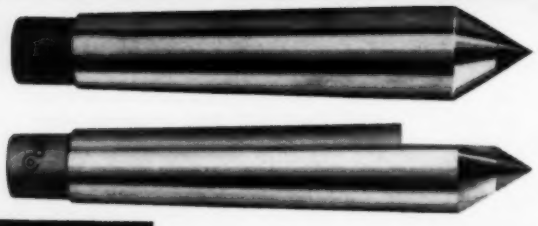
An abrasive specialist will be available for consultation on grinding.

Elgin Micronics New Plant

Elgin National Watch Company, Elgin, Illinois, plans to purchase an eight-acre site near Palatine, Ill., for a new research and engineering plant for Elgin Micronics, a company division.

A 15,000 square foot plant will be ready for occupancy this fall. It can be expanded to 60,000 square feet to meet future requirements.

NONE HARDER • NONE TRUER



BALAS CARBIDE CENTERS

Hardened to more than Rockwell "C" 60, the mirror finished alloy steel shank resists nicking which causes the center to fit improperly in the grinder resulting in scrap.

Highest quality, extra long carbide insert permits innumerable regrindings. Precision point is lapped to the smoothest possible finish.

Tested for accuracy by the most modern methods, these centers will turn out precision work. Extension on shank prevents damage when center is removed from the grinder.

Morse Taper, Brown and Sharpe Taper and Jarno Taper centers and half centers are available from stock in most popular sizes. Write for literature and prices.

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5 TYPES TO CHOOSE FROM

GRINDER WORK HOLDING DRIVERS

GUARANTEE QUICK CHANGE-OVERS, POSITIVE GRIP, UNMARRED WORK.

- Steel for extra strength.
- Balanced to prevent chatter.
- Finger tip control on cam action—self-locking.
- Quick adjustments for workpiece dia.

When ordering, please specify Steel or Brass Cams or Screws on Cam Action type.

Ask your distributor, or write for prices and catalog.

CAM ACTION
Steel or brass cams & screws. Cap. 3/16" to 4".

REVERSIBLE
Forged steel. 2 jaw sizes on ea. Replaceable brass tips and plates. Cap. 1/4" to 6".

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For plain or universals. Replaceable brass plates. Cap. 1/4" to 2 1/2".

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Permits close face plate work. Cap. 1/8" to 2 1/2".

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Helical slot in lap gives faster lapping action and longer lap life—entire area in contact with work. Tapered arbor and I.D. of internal lap permit true expansion. External holder is retractable.
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FINE GRAIN LAP IRON

INTERNAL WITH ARBORS — EXPANDABLE
Internal: 1/16" to 1-1/4" by 64ths, 1-5/16" to 3" by 16ths.

EXTERNAL WITH HOLDERS — CONTRACTIBLE
External: 1/8" to 1/2" by 64ths, 17/32" to 1" by 32nds, 1-1/16" to 2" by 16ths.

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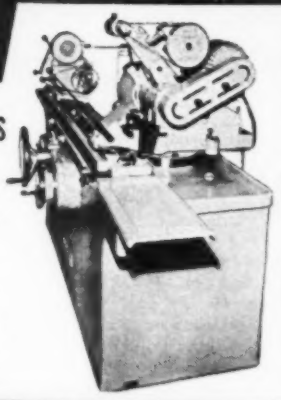

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Close tolerance production units capable of .0001" tolerances in production. Equipped for bar feed, thru feed, and infeed work with automatic ejectors and automatic cycling on infeed where desired.

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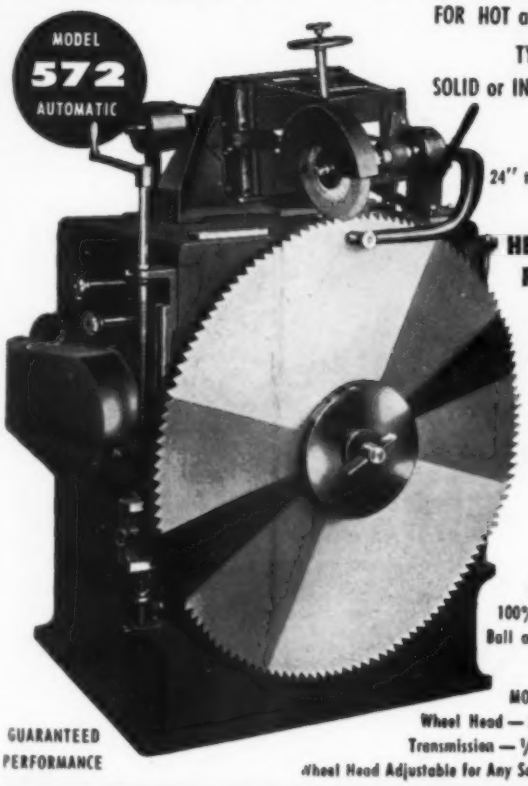
TYPES
SOLID or INSERTED TOOTH

MODEL 572 AUTOMATIC



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24" to 72" and Larger

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Wheel Head — 2 H.P. — 1800
Transmission — ½ H.P. — 1200

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Wheel Head Adjustable for Any Saw Tooth Angle

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- For Use on All Popular Surface Tool and Cutter Grinders
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HOFFMAN DIAMOND BITS

...for faster low cost drilling or grinding in hardest materials

Swivel, Adaptor and Barrel shown with Impregnated Bit

Impregnated or Surface Set

DRILL HARDEST MATERIALS KNOWN for accurate, high-speed production of glass, marble, ceramics, tungsten carbide and similar products. Hoffman Bits produce efficient coring and finish grinding results at operational speeds to meet requirements of most advanced production equipment.

LONG, EFFICIENT OPERATION grinding and finishing items with face widths as low as .015" . . . O. D. gauge remains constant for life of bit. Hoffman Narrow Kerf Bits are outlasting ordinary bits at better than a 4 to 1 ratio on many manufacturing operations . . . are eliminating heavy reject losses.

EASILY OPERATED ON EXISTING EQUIPMENT with no complicated change-over needed. Even ordinary hand drill rig is quickly converted to high-speed Diamond Drill Press with addition of Hoffman Air or Water Swivel and Narrow Kerf Bit. Diamond Impregnated or Diamond Surface Set Bits are recommended according to material to be drilled. Material samples are tested FREE in Hoffman Laboratories.

Write for Additional Information Now. Send in Sample of Material You Are Coring for FREE Testing.

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The new Grind-A-Matic is an air turbine grinding head which can be mounted either vertically or horizontally on almost any machine tool.

Its versatile application and high precision performance allow Grind-A-Matic to perform grinding operations normally done on an expensive jig grinder. Mounted the same as any standard tool, it becomes a close tolerance grinder for such work as internal grinding of tools, dies and fixtures.

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GRIND-A-MATIC

provides jig grinder performance at drill press prices

- *Fine radial adjustment from "0" to .070" while the spindle is rotating.*
- *Uninterrupted precision grinding*
- *Coarse adjustment from "0" through 1¼"*
- *Spindle speeds from 50 to 75,000 RPM*
- *Standard range from ⅛" to 2½" holes*
- *Adapted to include holes up to 5½"*
- *Sealed air turbine and spindle bearings*

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MONOCHROMATIC LAMP

MODEL 600A $100

Operates on standard 110-120 volt 60 cycle A.C. Complete with 6 foot cord and plug

Meet today's exacting production standards with modern precision inspection equipment. Acme Scientific's bright-field monochromatic lamps, with their nationally accepted optical flats, are the simple, economical, answer to your inspection and quality control problems. Make Acme Scientific's optical flats and brighter monochromatic lamps a part of your regular production set-up. For critical size measurement and gage accuracy inspection the scientific way. . . .

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"Offices" promote precision grinding.

32 Blast Cleaner Repays Cost in Eight Months
Table-room blast cleaning machine continues to pay off while producing cleaner castings.

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This article covers disc grinding from examples to guides for applications.

40 For Production, Economy, Flexibility . . . Abrasive Cutting—Part II
Conclusion of two part series covers work holders, case histories and guides to good application.

44 Wheel Testing—How, When and Why
Wheel testing is performed to obtain the lowest over-all costs and the most efficient production. This article suggests user procedure.

47 How Honing Improves Gear Quality
Honing gears after hardening greatly increases life.

48 Norton Celebrates 75th

49 Motorized Wheel Dressing and Records Cut Diamond Wheel Costs
Costs of wheel dressing can be reduced by dresser and related costs reduced by records.

Coming Next Month

Lapping Techniques Save Money—Improve Quality

Techniques employed by Western Hydraulics for lapping seals of various types provided a detailed account of one manufacturer's experience with this process.

Automatic Sizing and Finishing of Rubber Rolls

Cylindrical grinding of the rubber power rolls for electric typewriters presents an interesting grinding case history.

Crush Form Method Speeds Rod Mill Roll Grinding

Crush forming to shape and redress grooves in rod mill rolls cuts grinding time, permits use of harder, longer-wearing rolls.

Finishing Carbide Dies for Cold Extrusion Production

Finishing of carbide dies with diamonds reduces surface friction and prevents cutting under working pressures.

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Compare these Features....

Ruggedly reinforced with three full layers of fiberglass permanently resin-bonded and molded to shape. "American's" new Dished-Depressed Center Wheels possess unusual strength and resistance to breakage having nearly a 2:1 safety plus ratio over conventional depressed center wheels. This improved safety factor is made possible by the third full layer of fiberglass fabric, reinforced molded throughout the important bottom side — the most critical area that must withstand the greatest stress while grinding. This unique feature alone will appeal to the safety conscious wheel buyer who demands fast cutting performance along with long wheel life economy.

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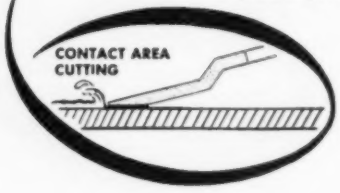
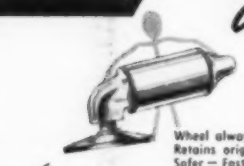
SPEED *(fast removal of metal)*

CONVENTIONAL FLAT WHEEL

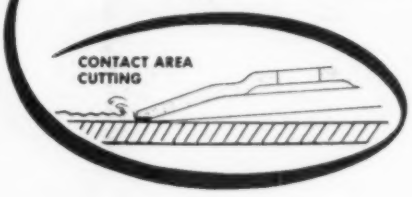
Wheel thins out at edge
Increases danger of wheel breaking
Greater contact area
Reduces grinder speed
Slows cutting action
Builds up heat
Grinder harder to hold



WITH NEW "American" DISHED-DEPRESSED CENTER WHEEL

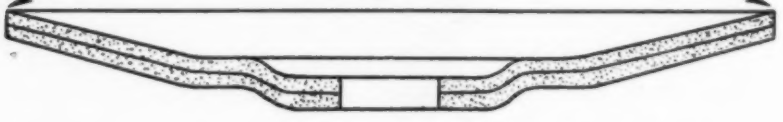


Wheel always cuts on periphery
Retains original thickness
Safer — Faster cutting — Narrow face contact area — Does not overload — Grinder retains power — Wheel cuts cool — Easier to hold



SAFETY

The New Safety Dish Shape permits the use of tough, flexible, "Armor Clad" glass cloth on the critical cutting side without sacrifice of grinding efficiency, giving nearly a 2:1 built-in safety ratio.

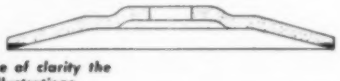


CONVENTIONAL FLAT WHEEL
CONTACT AREA SMOOTHING AND CLEANING

Generally considered an unsafe practice
Dangerously thins wheel
Kills power — slows operations

WITH NEW IMPROVED "American" DISHED- DEPRESSED CENTER WHEEL
CONTACT AREA SMOOTHING AND CLEANING

Safe operation — wheel thickness is maintained
Narrow contact area — cuts faster. Minimum power loss. Easier operation.



Always use a Guard . . . for purpose of clarity the Guard was not included in these illustrations.

COMFORT

with CONVENTIONAL FLAT WHEEL

awkward — tiring requires added pressure to make cut

WITH NEW "American" DISHED-DEPRESSED CENTER WHEEL

Provides more comfortable performance — easy to use with little pressure required to get cutting action or hold grinder steady.

"American" EMERY WHEEL WORKS

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Released after three years intensive study, this new bond has now created a wheel that has out-performed existing standards for the operations on which it was tested.

This Sterling plate-mounted wheel with the new V10-P Bond definitely offers more grinding at lower cost. It can be employed on a wider than usual range of operations with cooler, more easily controlled grinding action.

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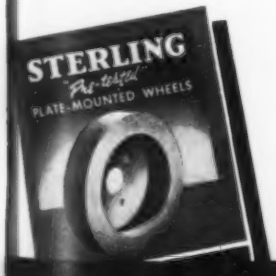

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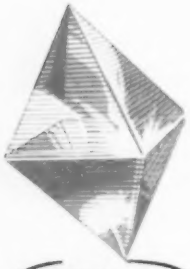
THIS TRU-GRIT® ROTARY DIAMOND DRESSING WHEEL forms grinding wheels with speed, accuracy and economy unapproached by any other method

It form dresses ANY grinding wheel—vitrified, resinoid, silicate, rubber or shellac bond. It has none of the limitations of crusher roll or single point diamond tool forming; it develops complex configurations and sharp, deep, square grooves with absolute accuracy, assuring exact reproduction in the work piece. It may do this in a single, quick pass between ejection and loading, without interrupting the production cycle. Downtime for tool changing on every shift is out; the Tru-Grit Rotary Diamond Dressing Wheel's finishing and dressing life goes far beyond anything known before. Savings in downtime, the increased number of pieces produced, the lower cost per piece over the life of the Tru-Grit Rotary Wheel are things to make cost engineers take a second look. But, perhaps the most dramatic difference of all is in the meticulous accuracy, fine finish and routine uniformity of the processed pieces. This is what quality control engineers have dreamed about and it makes quality control reports something of a formality. If you'd like facts and figures on actual applications of the Tru-Grit Rotary Diamond Dressing Wheel, write us.



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